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aircraft ILLUSTRATED

July 1977 Vol 10 No 7

Editor Martin Horseman

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The thin blue line

IN THIS ISSUE of *Aircraft Illustrated* and in *Air Extra No 17* which is due to be published at the end of July, we have surveyed the present organisation and strength of the Royal Air Force and examined its prospects in the short- to long-term future. The occasion of the Royal Review of the RAF at the end of July in this Silver Jubilee year provides a timely opportunity for our dual assessment of the Service's present and future position. Examples of much of the RAF's current hardware will be on display at RAF Finningley and there will be a welcome chance on 30 July for the public to take a look at the aircraft and meet the personnel

Cover: US Marine Corps AV-8A Harriers of VMA-231 during the recent cruise of the USS Franklin D Roosevelt.

Top: One of the Harriers over the Mediterranean and, below, aft view of the carrier's flight deck with Harriers, Phantoms and Corsairs being readied for launch. Gordon Bain

Frontispiece: General Dynamics F-111E of the 20th TFW at Upper Heyford — the subject of the initial feature in the 'Units of USAF' series in the June issue. Martin Horseman

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who man the front line and its support.

So how does the Royal Air Force of 1977 compare with the organisation which existed 25 years ago and what have been the principal influences which have shaped the evolution of the modern fighting force? To what tasks is RAF air power now dedicated and how will these requirements develop in the future? What are the concepts embodied in its strategic and tactical planning and how are these reflected in equipment and training? Is the current inventory of aircraft and related systems sufficient for the RAF to meet its commitments and what progress is being achieved in future programmes?

In line with the contraction of the UK's role in world affairs during the past quarter century and as a result of the constraints of the country's economic circumstances for most of this period, the RAF is a much more compact force than it was in 1952. Its number of aircraft has decreased from over 6,000 to less than 2,000 and its personnel strength had receded from 270,000 to 87,000. In itself this reduction in the scale of the service has not been wholly inappropriate given the severance of worldwide commitments. However, it has been compounded by inflation and financial restrictions which at a time of rising equipment and manpower costs have made the process of adjustment that much more severe and the nature of the re-organisation that much more fundamental. There has been a major shrinkage in command structures and a continuous review of procedures and practices to secure the savings dictated by successive downward revisions of defence spending.

By dint of a vigorous and critical appraisal of its activities the RAF has managed, nevertheless, to offset the extreme effects of this economic retrenchment by streamlining its organisation and staffing, concentrating resources on the

maintenance of its front-line strength and imparting a new flexibility to the tasking of its operational squadrons. The ultimate aim of this tremendous effort to economise wherever and whenever possible has been to maintain and develop the capability of the forces deployed by the two remaining operational commands — Strike Command and Royal Air Force Germany.

Throughout these endeavours the RAF has been aided enormously — perhaps more than the country deserved to expect or dared to hope — by the unstinting effort of service-men and -women to adapt to the changing facets of Service life and to the convolutions imposed by the country's economic difficulties. Examples of the efficiency and flexibility with which they have approached their task are legion and their collective effort has ensured that the RAF spirit remains undiminished and exemplified by achievements such as those reported on pages 274-277 of this issue.

Despite the degree to which the search for repeated economies has resulted in the identification of areas in which savings have been made, there is a point beyond which a continuation of the process would seriously jeopardise the ability of the RAF to conduct its future tasks. The conclusion which could be reached with justification today is that such a point has indeed been passed and that far from imposing any additional cutbacks on the Service, prompt consideration should be given to further funding. There is an urgent need *inter alia* to correct the deficiency in the numbers of aircraft which are available, to expand stocks of equipment and stores (especially in RAF Germany), to broaden the scope of the expenditure on operational training and, above all, in the immediate future, to ensure that pay and career prospects are improved. Any prolongation of the political complacency which the RAF (and the other Services) has had to endure in the last few years is unthinkable.

UNITS OF USAF
No 1: 20th TFW

Paul Humphreys

A Jubilee Year record

AIRSCAN, nee SIDESCAN, always has been a snapper-up of good news and this month's up-snapped is certainly a case in point. It is, moreover, a milestone in aviation which seems to have passed almost unremarked, even by some sections of the aviation press. It is a world record established in Great Britain by a great Briton in a not very new British machine. Mystified? It's not surprising, for the achievement is the world gliding altitude record now pushed up to 51,850ft by Mike Field in a Skylark sailplane.

We Brits who have been used to Sierra Nevada standing waves taking US sailplanes to stratospheric heights, we can be excused for being caught, metaphorically, with out spoilers out. Field used a standing wave created by north-east winds over the Cairngorms to get his initial lift; after that upper wave systems pushed him more than a mile higher than the 16-year old US-held record. But it wasn't just a case of sitting there, gripping the pole, and making like the birds. Despite an air data computer of his own design, VOR/ADF gear plus a pressure suit, helmet and electrically heated socks to combat the environmental hazards, Field still had to fight icing and oxygen shortage during and after his record climb, ending, with a dizzy but intentional high rate-of-descent spin from 40,000ft — which screeched down to 2,000ft when his elevators iced up!

In the Queen's Coronation Year British skill and tenacity put Hilary 29,028ft high on Everest; in Her Majesty's Jubilee Year the same qualities have put Field nearly twice that height. Let's pay full tribute to the Stratoglide project and all concerned with it for bringing this record to Britain.

The oil and gasman cometh

During the past decade here in the UK the activities associated with our offshore oil and gas industry have assumed a position of growing importance in many industries as well as in our daily lives. The price of seeking and tapping these energy sources is high, and sadly the price is rising and being reckoned not only in terms of time, effort and money but also in human lives. New safety regulations for the North Sea's UK sector, to be the responsibility of the Health and Safety Commission, are due to be announced this summer. They will include 'aircraft and vessels connected with construction, maintenance, loading and unloading' work. They come not a moment too soon.

A swift 'scan' through the Department of Energy's Brown Book reviewing the oil

industry, shows that, during 1976, there were four serious and one fatal accidents involving helicopters where there had been none the previous year.

The recent strike by Bristow Helicopters' pilots, who fly ferry services of around 25 flights a day, has alerted us to the role played by these aircraft and their crews in the task of extracting oil and gas from below the sea. The blow out on Ekofisk Bravo rig has highlighted the hazards involved. Jointly the two events underline the paramount importance of safety in every aspect of submarine prospecting, including that of offshore helicopter operations.

Had this strike not occurred, during this year some 30,000 helicopter flights would have been made from Sumburgh and Dyce to the various drilling rigs and production platforms up to 300 miles offshore. They would have carried more than 500,000 passengers plus a lot of emergency repair equipment and other urgently needed stores.

Those flights from Sumburgh, and they are about one third of the total, are made under the control of an air traffic organisation established by the helicopter operators and advised by the Civil Aviation Authority, in the absence of any more official ATC facilities. It is not fully radar-equipped and owes its birth largely to a near-miss in 1974, which scared the rotorheads out of all involved. Dyce, as Aberdeen's airport, has complete ATC facilities.

Out on the rigs and platforms safety regulations are rigorously applied — though human and mechanical failings have precipitated a number of tragic accidents. It seems, however, that in the matter of helicopter operations the authorities have been acting only with CAA advice, and therein is cause for some concern.

The DoE, splendid though it may be in its own specialised field (and this E-type Department is for 'Energy and not 'Environment') cannot be expected to understand all the subtle safety requirements of operating helicopters. With CAA advice it is responsible, for example, for producing the specifications for the helidecks, detailing their size and condition and the free approach area. All these are prepared initially with an oil man's bias, no doubt.

These regulations also require that each installation shall have a helicopter landing officer. Clearly his work load in this important role is not sufficient to warrant someone employed full-time on this task; thus an employee on the 'island' is given training in the job. Generally the CAA accepts that these officers are competent, but there have been cases where other employees have been less than careful when it comes to the whirlybirds. An example is the crane operator who swung his

jib across the flight path of an approaching helicopter. Being charitable, which is difficult for your man Humphreys who's interests are with aeroplanes rather than cranes, the driver may not have realised that helos are not as manoeuvrable as he thought. Or perhaps he just couldn't have cared less.

This is only one of a number of incidents making the offshore chopper pilot's life that much more hairy. With the growing rate of flights — strikes permitting — the hazard rating is mounting too. Now is the time to bring these operations under close control, establish safety regulations, ensure that not only the landing officers are fully trained but that all personnel on the rigs and platforms are aware of the requirements for safe helicopter operations, and provide comprehensive ATC facilities at all bases from which they fly. This is the way to keep the safety record clean.

BF... SOS... SAR

There's now news in virtue, as Airscan has opined before, so the routine flights by Bristow Helicopters have gone unnoticed; it's only when there's trouble at t' mill that the choppers get into the news. It's the same with the Search and Rescue helicopters.

Summer, hopefully, is now well under way. But it brings the season when the RAF and RN SAR units are called upon to rescue the intrepid but ill-equipped climber, the press-on private pilot or yachtsman and the heedless youngster from the consequences of their foolish actions on land, sea and airbed. Unfortunately, they put at risk the lives of those who come on rescuing wings as well as their own.

Thus, your scribe makes a special, but simple, plea to all who sally forth on pleasure bent without first making sure that all safety precautions have been made, all flight plans filed, that standing and running rigging and spars are serviceable — and that there is an on-shore wind and flowing tide before paddling out on the Li-Lo. Don't!



More TriStars for Saudia

SAUDI ARABIAN AIRLINES (Saudia) has announced that it is to buy two more Lockheed L-1011 TriStars. The new orders are for the -200 version of the aircraft thus increasing the airlines order for this model to five and, with the five -100s already in service, boosting the planned Saudia TriStar fleet to ten. The first of the L-1011-200s which figured in the earlier order was scheduled to have begun operations in June and the two aircraft which are the subject of the repeat order are expected to be delivered in late-1978.

Saudia's L-1011-200 TriStars are each powered by three Rolls-Royce RB211-524 engines which provide considerably more thrust than the RB211-22Bs used on the basic TriStar thereby conferring among other benefits improved take-off performance in hot weather and from high altitude airports. The L-1011-200 for Saudia will seat 253 passengers and have a range of 4,450 statute miles (7,160 km) compared to the basic TriStar's 3,580 statute miles (5,760 km). Saudia began TriStar services in August 1975 and now operates the aircraft on routes from Jeddah to Bombay, Cairo, Dhahran, Dubai, Geneva, Karachi, London, Paris, Riyadh and Rome.

Air Tanzania in business

Following the cessation of operations by the tri-national carrier East African Airways Corporation earlier this year the participating countries have continued air transport services with their own national airlines, Uganda Airlines, Kenya Airways and, now, Air Tanzania Corporation.

Air Tanzania has recently ordered two Fokker F27 Mk 600s for delivery in October and December 1977 and its services will also make use of two ex-EAA F27s which were already operating in the country. The new F27 aircraft will each have a 44-seat arrangement and will be equipped with a rough-field landing gear especially developed for operations from unprepared strips. The Friendships will serve the Tanzanian domestic network which links 18 locations. Air transport is of the utmost importance of the development of this African country, one main reason being the great number of development projects in all parts of Tanzania that are difficult to reach by other means of transport.

Total sales of the Fokker F27 Friendship now stand at 656 to 145 customers in 56 countries. Included in this figure are the 205 aircraft built under license by Fairchild Industries in the US.



Tornado flight envelope extended beyond Mach 1.9

Panavia Tornado prototype 02 has been flown at a speed significantly over Mach 1.90 in level flight during routine test flights from Warton according to NAMMA, the NATO Government Agency in charge of the Tornado programme. This achievement was attained even though the aircraft is still powered by 'development' rather than 'production' engines. During the test flights, Prototype 02 was fitted with one 'dash 2' version of the Turbo-Union RB-199 engine, and another to the 'dash 3' standard; both versions are substantially less powerful than the scheduled 'dash 4' production units which will power the aircraft in NATO service. Having exceeded Mach 1.9, Tornado 02 was still accelerating at the end of its pre-planned run.

According to NAMMA the routine tests proved beyond doubt that when the more powerful 'dash 4' production-thrust engines are fitted later this year, the performance of the Tornado will be further enhanced to full specification standards with resultant benefits to the all-important regime of supersonic acceleration.

DHC Dash 7 approved

De Havilland Aircraft of Canada received Government approval for its new 50-seat

Top: British Aerospace has announced the signing of a Protocol with the Romanian Ministry for Foreign Trade covering a major export deal worth several hundred million dollars for the construction of the BAC One-Eleven 475 in Romania. Photo shows a One-Eleven series 525FT in the markings of the national airline, Tarom, at Filton in April. Austin J Brown

Above: Navy version of the Lynx equipped with four Sea Skua missiles which will be carried by the helicopter in the ASV role. Westland Helicopters Ltd

Dash 7 Q/STOL airliner in early-May. The Dept. of Transport's Type Approval paves the way for the Dash 7's entry into commercial service, having met the requirements of US Federal Aviation Regulation Part 25, including Amendment 31, to which standard Canada's DOT has issued its Type Approval.

The first production Dash 7 (serial No 3) was rolled out on 2 April and meanwhile, Dash 7 serial number one has been undergoing interior refurbishing, replacing its sophisticated test installations with the Dash 7's modern airline interior. This aircraft was due to make its debut at the Paris Airshow last month and to follow this with an extensive European sales demonstration tour.

Airbus leased by Eastern

Airbus Industrie has announced a significant development in its marketing of the A300 Airbus in the US with the decision of Eastern Airlines to acquire four A300 wide-bodied aircraft on a six months lease. Eastern will become the first US operator of the 237-seat aircraft, which will be used on selected routes among which are the high density markets between New York/Newark and Miami/Ft Lauderdale, West Palm Beach, Tampa and Orlando.

The Eastern acquisition is generally viewed as a key to the purchase of the A300 by the Miami-based carrier and by other US airlines.

Eastern Airlines' Chairman and President, Frank Borman, said: "The agreement provides Eastern the unique opportunity to operate the A300 within the demanding parameters of day-to-day scheduled service to determine its capabilities on our system", and added that the lease "is a welcome opportunity to determine the A300's compatibility with Eastern's system". For its part, Airbus Industrie hopes the lease will demonstrate that the A300 is capable of operating profitably on Eastern's system and that the airline will then exercise its option of acquiring the four leased aircraft plus a substantial number of A300 B2 and B4 aircraft required over the years ahead.

A total of 32 A300s is now in operation with seven airlines and two charter carriers. In service with Eastern Airlines, the A300 will have 26 first class seats arranged 2-2-2 across the cabin, with 211 economy class seats in a 2-4-2 arrangement. The belly will carry 20 LD-3 containers with a 2,830lb capacity each, plus 565 cubic feet for bulk cargo. The first of the four aircraft to be acquired will be delivered to Eastern's Miami, Florida, headquarters in early-August for pilot training. A start to scheduled services is targeted for late-November and all four aircraft will be available for the start of the peak winter traffic movements which begins on 15 December.

RAFG Jaguar squadrons take first four places in Salmond Trophy

For the third year running, No 14 Squadron, based at RAF Bruggen in Germany, has won the annual RAF Germany Navigation and Bombing Competition for the *Salmond Trophy*. The four Jaguar squadrons taking part in the competition took the first four places, No 17 Squadron coming second, No 2 third and No 31 fourth. The competition was open to seven squadrons in RAF Germany and included were units flying Buccaneers and Harriers as well as the Jaguar squadrons.

Each sortie commenced with a naviga-



tion phase to an en route field target and concluded with bombing runs at the field target were revealed to competitors only one hour before their time over the location and points were scored for timing and accuracy. On the bombing range NATO standards of accuracy were used to judge the results. Eight Jaguar sorties achieved 100% scores as a result of perfect timing and direct hits on the bombing range targets thereby providing further demonstration of the significant capability of this attack aircraft in hitting ground targets 'spot on' at the first attempt.

Saudi Arabian selection. Photos show, from top to bottom:

Boeing 727-30, HZ-TA1 of Prince Talud bin Abdul Aziz at Heathrow on 15 April.

R Kunert

F-27A leased by Saudia from Hughes Aircraft at Shannon on 16 April during its delivery flight. David O'Mahony

DC-8-63F, N8636, one of two leased to Saudia by Seaboard World Airlines, at Heathrow on 16 April. R Kunert

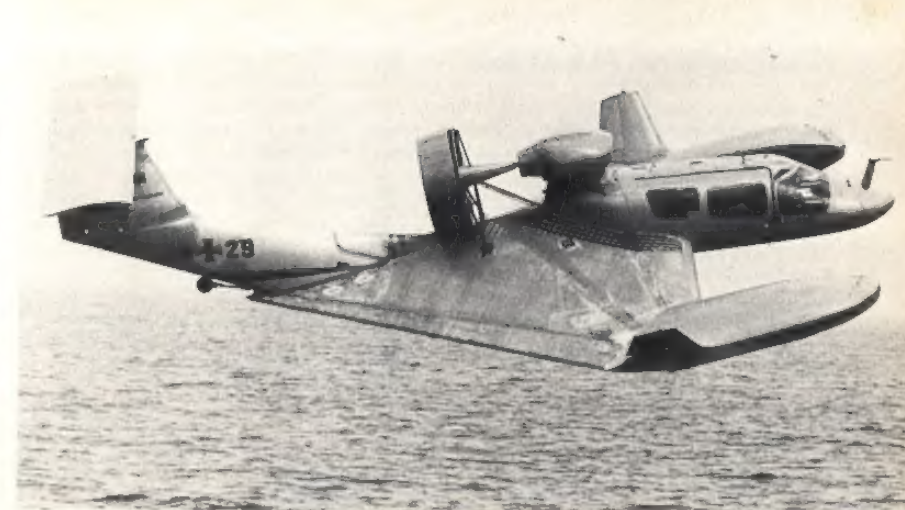
HS125 Series 600, HZ-AMM, purchased by the owner of a major civil engineering company, Al Jazirah Al Arabiah, for communications tasks in Saudi Arabia and the Middle East. Hawker Siddeley

AIRCRAFT ILLUSTRATED

Ground effect craft tested over the Baltic

Initial tests with the X 114 experimental craft over the Baltic Sea have recently been successfully completed. The ground effect craft was developed by the VFW-Fokker subsidiary Rhein-Flugzeugbau (RFB) under contract to the West German Ministry of Defence. The six-seater X 114 can reach a cruising speed of 150 kph with a maximum flying time of about 20 hours over a range of some 2,000 km. The aerofoil craft exploits the ground effect: a reverted delta wing with a negative V shape covers a cavity in the proximity of the ground and water surface. This cushion reduces the drag and automatically stabilises the craft at that height.

In contrast to other ground effect craft the X 114 can, like an aircraft, fly freely when necessary and, for instance, leap over obstacles. Functional tests of the individual systems were primarily performed during the initial test which lasted several weeks. These investigations were, amongst other things, focussed on the stability and manoeuvrability as well as the structural behaviour of the X 114. There are interesting applications for this craft in the military sector. In the civil sector the operation of the X 114 as a cost-effective means of transport over water and relatively even surfaces appears promising.



JAL orders two DC10s

Japan Air Lines has ordered two more DC-10-40s to add to its existing DC-10 fleet of six aircraft. The new aircraft are scheduled to enter service on the airline's domestic routes in October 1978. The decision to purchase has been influenced by increased domestic passenger demand in recent months and by the anticipated opening of the new Tokyo international airport at Narita at the end of this year or the beginning of 1978. When Narita does open there will be an increase in the capacity of the existing Haneda Airport to handle domestic flights which will enable JAL to step up the frequency of its domestic services.

The new aircraft, in common with the rest of the fleet, will be fitted with the new Pratt and Whitney JT9D-59A engine which delivers 53,000 lb of thrust and is designed to operate at lower noise levels. The DC-10 entered service with JAL in July 1976 and the airline currently operates four aircraft on domestic routes and two on international. The JAL domestic DC-10 network features services between Tokyo and Sapporo, Fukuoka and Okinawa while the international services began in April on the Tokyo-Singapore and Tokyo-New York routes.

JULY 1977

RR-powered 747 certified

Boeing 747-200B airliners powered by Rolls-Royce RB211-524 engines were certificated for commercial service by the US Federal Aviation Administration, on 4 May.

FAA certification means the 747 is now approved for operation with engines from all major manufacturers of high-bypass-ratio powerplants — Pratt and Whitney JT9Ds and General Electric CF6-50s as well as the Rolls-Royce engines rated at 50,000 pounds thrust. Certification tests were carried out with the first two of six British Airways 747-200s ordered with Rolls-Royce engines and test flight hours totalled more than 250. British Airways was the first airline to order the 747 with the British-built powerplants: the first two Rolls-Royce-powered 747s were due to have been delivered in May with a third following in July and the other three in March-April 1978.

American orders nine 727s

American Airlines announced in May that it has ordered nine more Boeing 727-200s

Top: The X 114 experimental ground effect craft over the Baltic. RFB

Above: The first of Air Canada's modified TriStar Dash 10s (C-FTN/510) which have been retrofitted to -100 standard for transatlantic services, seen at Heathrow. Austin J Brown

with delivery scheduled in late-1978. Including the aircraft covered by this latest order American is now scheduled to take delivery of 30 new 727s from Boeing in 1977-1978, 16 of these having been ordered during 1976.

The nine 727s in the new order (series 727-223) will replace older Boeing 707s which are less fuel efficient and do not meet federal noise standards. The recent American order increases to 80 the number of new 727 orders received by Boeing in 1977. Total orders for the 727 now stand at 1,437.

Yeovilton open on 25 & 28 June

To enable the public to see part of the Navy's celebration of the Queen's Silver Jubilee, the Royal Naval Air Station at Yeovilton will be open on Saturday 25 June and Tuesday 28 June. Large numbers of Royal Navy fighters, strike aircraft and helicopters will take-off from Yeovilton to form the Jubilee Fly-past of Naval aircraft during the Queen's Review of the Fleet at Spithead. In all some 72 aircraft including Phantoms, Hunters, Canberras, Lynx and Sea Kings will be involved.

Saturday 25 June is the dress rehearsal day when the station will be open from 09.00 and the main take off will be at approximately 10.20. Tuesday 28 June is the Review Day when the station will open at 15.00 and the main take-off will be at approximately 16.00. A large viewing enclosure and some aerial entertainment has been arranged at Yeovilton to fill the gap between the mass take-off and the subsequent landing on both days. Each day will provide the General Public with a unique opportunity to see Fleet Air Arm aircraft taking off and landing en masse.

The entrance fees to the spectator area will be Adults 25 pence and Children (5-14) 10 pence and the proceeds will be donated to the Queen's Silver Jubilee Appeal Fund.

Below: Line-up of Royal Navy fixed- and rotary-wing types at RNAS Yeovilton from which the FAA will launch a major part of its Royal Review flypast of the Fleet at Spithead. Photo: HMS Heron



Below: HS 125 srs 600 G-MFEU on delivery to Massey Ferguson at Coventry Airport on 8 March 1977 Roger Wright



Below: Bell 212 G-BERF en route to Bristow Helicopters seen at Antwerp on 3 May 1977 Foto L Vervoort



airregister

Compiled by A J Wright

THE FIRST ENTRY is not a misprint, it really is G-ABEV. These marks were originally allocated to a 1932 Blackburn Bluebird, but were not taken up. The elderly DH60 will certainly look more authentic than it would wearing a registration from the current series.

The BAC hardware will use its marks for a short time at Paris, after which the Strikemasters will disappear for service abroad.

Transmeridian's long awaited entry into the jet era comes with their first DC-8 to arrive in the UK. Previously it served with Martinair and African Safari, in whose zebra camouflage livery it appeared on delivery.

Registration	Type	C/n	Owner or operator
G-ABEV	DH60G Gipsy Moth	1823	RI & JO Souch (HB-OKI/CH-217)
G-BEON	Sikorsky S-61N	61770	British Airways Helicopters Ltd
G-BEPU	PA-31-350 Navajo Chieftain	7552114	Fairflight Charters Ltd (OY-BLF)
G-BEPY	Commander 112B	524	Glos-Air Ltd
G-BERD	Thunder AX6-56A balloon	108	Thunder Balloons Ltd
G-BERF	Bell 212	30782	Bristow Helicopters Ltd
G-BERG	SA330J Puma	1472	Bristow Helicopters Ltd
G-BERH	SA330J Puma	1475	Bristow Helicopters Ltd
G-BERI	Commander 114	14234	Glos-Air Ltd
G-BERJ	Bell 47G-A4	7512	GMH Wills
G-BERK	Not to be allocated		
G-BERL	AA-5B Tiger	0466	Cabair Ltd
G-BERM	AA-5A Cheatah	0352	Cabair Ltd
G-BERN	Saffery S330 balloon	4	B Martin
G-BERO	W-Bell 47G-3B1	WAS210	Autair Ltd
G-BERP	HS125 srs 700A	257003	Hawker Siddeley Aviation Ltd
G-BERR	Thunder AX7-77A balloon	110	Thunder Balloons Ltd
G-BERS	Thunder AX6-56A Balloon	108	Thunder Balloons Ltd
G-BERT	Cameron V-56 balloon	273	Semajan Ltd
G-BERU	Not yet allocated		
G-BERV	HS125 srs 700A	257005	Hawker Siddeley Aviation Ltd
G-BERW	Commander 114	14214	Glos-Air Ltd
G-BERX	HS125 srs 700A	257006	Hawker Siddeley Aviation Ltd
G-BERY	Not yet allocated		
G-BERZ	Skyvan srs 3	SH1956	Short Bros & Harland Ltd
G-BESA	Beechcraft B.5B	TH-406	Oldham Aviation Ltd
G-BESB	BN-2A Islander	841	Britten-Norman (Bembridge) Ltd
G-BESC	BN-2A Islander	842	Britten-Norman (Bembridge) Ltd
G-BESD	BN-2A Islander	843	Britten-Norman (Bembridge) Ltd
G-BESE	BN-2A Islander	844	Britten-Norman (Bembridge) Ltd
G-BESF	BN-2A Islander	845	Britten-Norman (Bembridge) Ltd
G-BESG	BN-2A Islander	846	Britten-Norman (Bembridge) Ltd
G-BESH	BN-2A Islander	847	Britten-Norman (Bembridge) Ltd
G-BESI	BN-2A Islander	848	Britten-Norman (Bembridge) Ltd
G-BESJ	BN-2A Islander	849	Britten-Norman (Bembridge) Ltd
G-BESK	BN-2A Islander	850	Britten-Norman (Bembridge) Ltd
G-BESL	BN-2A Islander	2001	Britten-Norman (Bembridge) Ltd
G-BESM	BN-2A Islander	2002	Britten-Norman (Bembridge) Ltd
G-BESN	BN-2A Islander	2003	Britten-Norman (Bembridge) Ltd
G-BESO	BN-2A Islander	2004	Britten-Norman (Bembridge) Ltd
G-BESP	BN-2A Islander	2005	Britten-Norman (Bembridge) Ltd
G-BESR	BN-2A Islander	2006	Britten-Norman (Bembridge) Ltd
G-BESS	Hughes 369D	029	Sloane Aviation Ltd
G-BEST	Not yet allocated		
G-BESU	BN-2A Islander	2008	Britten-Norman (Bembridge) Ltd
G-BESV	BN-2A Islander	2009	Britten-Norman (Bembridge) Ltd
G-BESW	BN-2A Islander	2010	Britten-Norman (Bembridge) Ltd
G-BESX	BN-2A Islander	2007	Britten-Norman (Bembridge) Ltd
G-BESY	Strikemaster 167 Mk88	—	British Aircraft Corporation Ltd (G-27-299)
G-BESZ	Strikemaster 167 Mk88	—	British Aircraft Corporation Ltd (G-27-300)
G-BETA	Rollason Beta B2(A)	01	JL Kinch
G-BETB	Jaguar T2	—	British Aircraft Corporation Ltd (G-27-279)
G-BETC	Cameron V-56 balloon	253	PG Dunnington
G-BETD	Robin HR200/100	20	Culham Air Ltd (PH-SRL)
G-BETE	Rollason Beta B2	02-10169 (Ex 1304)	TM Jones
G-BETF	Not yet allocated		
G-BETG	Not yet allocated		
G-BETH	Not yet allocated		
G-BETI	Pitts Special S-1D	7-0314	EB Bray
G-BETJ	DC-8-33	45379	Transmeridian Air Cargo Ltd (5Y-ASA/PH-DCD)
G-BETK	Commander 500S	3137	GR Tait
G-BETL	Not yet allocated		
G-BETM	PA-25-235D Pawnee	7656066	Miller Aerial Spraying Ltd
G-BETN	Short SD3-30	SH3010	Short Bros & Harland Ltd
G-BETO	Not yet allocated		
G-BETP	Cameron O-65 balloon	286	JR Rix & Sons Ltd
G-BETR	Cessna A188	02850T	Mindaire Ltd
G-BETS	Not yet allocated		
G-BETT	Not yet allocated		
G-BETU	Piper J3C-65 Cub	12589	JR Ramshaw (F-BETU/44-80293)
G-BETV	Not yet allocated		
G-BETW	Rand KR-2	KR2/TRW1	TR Wiffen
G-BETX	HR748 srs 2A	1753	Hawker Siddeley Aviation Ltd
G-BETY	HS748 srs 2A	1752	Hawker Siddeley Aviation Ltd
G-BETZ	HS748 srs 2A	1751	Hawker Siddeley Aviation Ltd
G-BRIK	Tipsy Nipper Mk3	PFA25-10174	CWR Piper
G-GBSC	King Air E90	LW242	British Steel Corporation
G-MFEU	HS125 srs 600B	256062	Massey-Ferguson Holdings Ltd
G-OODE	Stampe SV-4A	500	RN Goode (G-AZNN/F-BDGI)



A Look Back at GATWICK

Terry A Brown

ALTHOUGH OFFICIALLY OPENED by the Secretary of State for Air Lord Swinton, on 6 June 1936, Gatwick had been the home of the Surrey Aero Club for a number of years and initially licensed as an aerodrome by Home Counties Aircraft Services in August 1930.

The new airport incorporated many novel design features including a subway to the specially-built railway station and covered walkways from the airfield buildings to the aircraft. British Airways Ltd used the airfield for a while from early-1936 operating their fleet of De Havilland DH 86s G-ADYG, G-ADYH, G-ADYI and G-ADYJ on daytime passenger and night mail flights to the continent. By mid-1936 they had also taken over the ex-Hillmans Airways Ltd DH 86s (G-ADEA, G-ADEB and G-ADEC) but by 1938 had moved out to Heston.

Gatwick was also the home of No 19 E&RFTS, one of the many reserve flying schools formed during this period. It flew a collection of aircraft

including Miles Magisters, DH Tiger Moths, Hawker Audaxes and Fairey Battles. In September 1939 the airfield came under the control of the Air Ministry and the flying school was disbanded.

During the war a number of units were to use Gatwick, the first being a detachment of No 92 Squadron flying Bristol Blenheim 1F fighters which arrived in December 1939 and stayed until May 1940. Numbers 18 and 57 Squadrons, also flying the Blenheim arrived in May 1940, but they had moved out again in July when No 98 Squadron reformed with Fairy Battles before moving to Iceland. One of the longest resident units was No 26 Squadron which arrived on 3 September 1940 equipped with Westland Lysanders and serving in the army co-operation role; by February 1941 the squadron had started to receive some Tomahawks for day intruder duties, although it retained the Lysanders until May 1942.

The Tomahawks were later replaced by Mustangs, these being used in attacks against communications

targets across the channel, and the squadron later transferred to Yorkshire. Two further squadrons, Nos 63 and 171, were formed at Gatwick in June 1942 for army co-operation duties, flying Mustangs and Tomahawks on tactical reconnaissance missions across the channel.

In June 1943 control of the airfield passed to No 11 group, Fighter Command, and in October Nos 19 and 65 Squadrons were reported as having detachments there while in June 1944, 229 and 274 Squadrons arrived for a short stay, both equipped with Spitfire IXs.

During the later years of the war Gatwick was also the home of several communication units including No 85 Group communications flight. In August 1944 No 287 squadron arrived equipped with Oxfords, Tempests, and Spitfires to carry out anti-aircraft co-operation duties, but by January 1945 they had left for a new base at Redhill.

With the end of the war Gatwick passed into the care of the Ministry of Civil Aviation although it remained almost unused for a number of years,



Left: Lockheed Constellation, G-ALAK, of ACE Freighters at Gatwick in September 1966.

Below left: British United's first BAC One-Eleven, G-ASJA.

Bottom left: Morton Air Services' DH Heron, G-AVSA, at Gatwick on 4 May 1968.

All photos: Terry A Brown

partly due to the lack of a proper paved runway. Among the earliest post-war operators were Ciro's Aviation Ltd. This company was formed in December 1946 and it later used two C-47's on the Berlin airlift, the aircraft being employed subsequently on charter tours to Europe and North Africa. Hornton Airways was also formed at Gatwick in late-1946 operating air taxi services with a Percival Proctor 5, G-AIEP. Hornton's equipment was built up to include several Airspeed Consuls, a Rapide and a Dakota, these operating charter, passenger and freight services. In the interim Gatwick had also become the location for a maintenance base set up by Airwork for the repair and overhaul of Royal Navy Hornets and Seafires.

The decision to make Gatwick into London's second airport marked a major turning point in the history of the airfield and in preparation for the development programme all units were moved out and the airfield was closed for complete reconstruction in March 1956. Gatwick remained closed for two years while the massive rebuilding effort was undertaken. This included the laying of a single 7,000ft runway to the north of the old airfield, together with new taxiways and aprons. New terminal buildings were also constructed over the main A23 road and linked to a new railway station to be served by a regular service to central London. Initially a single 900ft long pier linked the terminal buildings with the aircraft operating areas. Later two further piers were added — the first of their type in Europe. The new facilities were completed at a cost of £8million and the airport was reopened by Her Majesty the Queen on 9 June 1958.

In 1959 the summer season started with African Air Safaris flying inclusive tours to Munich, Nice, Palma,



Rotterdam, Dusseldorf, and many other destinations using two Vickers Vikings, G-AHOR and G-AHOW. In June of the same year Airwork began the Gatwick to Khartoum service using Viscount 831s for Sudan Airways, leaving on Mondays and returning on Thursdays.

A large amount of new traffic came to Gatwick with the formation of British United Airways in March 1960 from the merger of Airwork and Hunting Clan and all the subsidiaries including Airwork Helicopters, Bristow Helicopters, Morton Air Services, Olly Air Services and Transair. At its formation British United operated a varied fleet of Bristol Britannias (including G-ANCD, G-ANCE, G-AOVE, G-AOVI, G-ARWZ, G-ARXA, G-APNA, G-APNB) and Douglas DC-6s (G-APNO, G-APNP, and G-ARXZ) plus a number of Viscounts. Initially BUA scheduled services were operated to Gibraltar, Rotterdam, Le Touquet, Jersey and Guernsey, and the airline conducted a large number of government troop and freight flights to RAF bases in West Germany including Gutersloh and Wildenrath. British United was the first British-based airline to put the BAC One-Eleven into service, operations beginning when G-ASJA was taken on charge in late-1965. After the remainder were delivered they were used by the airline to build up a comprehensive domestic network. Regular services to the Channel Islands were operated by British United (CI) Airways using a mixture of Douglas DC-3s, De Havilland Herons and Handley Page Herald. With the take-over of Jersey Airlines and their aircraft, some of the DC-3s and Herons were transferred to Morton Air Services.

By 1964 Gatwick was approaching a period of expansion in its operations particularly influenced by the increase in charter flights and inclusive tour operations. During the mid-1960s the airfield was busy with aircraft arriving from all over Europe, the United States and Canada. Many of the movements were Douglas DC-6s and -7s and on some days up to a dozen could be seen on the stands at one time. One of the most frequent European operators into Gatwick was Societa Aerea Mediterranea (SAM),



their DC-6's including I-DIMA, I-DIMB, I-DIME, I-DIMP and I-DIMU. Aircraft of Spantax SA the Spanish tour carrier were also frequent visitors with DC-6s and -7s, among which were EC-ATR, EC-ATQ, EC-BBK, EC-BBT, EC-BDL and EC-BDM.

Many other DC-6s on transit included LN-SUI and LN-SUM of the Norwegian operator Braathens SAFE, F-BOEX of Trans Union and D-ABAY and D-ABAZ of Germanair. On less frequent occasions the DC-7Cs N-286 and N-287 of Temple Airlines could be seen operating charter flights, while others of the type were operated by Balair (HB-IBR, HB-IBU and HB-IBZ), KAR AIR, Sterling, Sabena, Trans Europa Ariana and Inex Adria Airways.

The Douglas transports were not the only piston-engined types using the airfield, however, for in May 1960 Dan Air had moved in to make Gatwick its new home — the relocation being forced by the closure of their previous base at Blackbushe. The company brought with it its fleet of Bristol Freighters (G-AINL, G-AMLL and G-APLH) and Dakotas (G-AMSS and G-AMSU). At the close of the previous year the Dan Air inventory had started to expand with the purchase of three Airspeed Ambassadors from Butler Air Transport of Australia (G-ALZX, G-AMAE and G-AMAH) the first of

Top: Caledonian Airways was one of the major Bristol Britannia operators based at Gatwick. Photo shows G-ASTF taxiing out on 7 April 1968.

Above: A rare example of the DC-3 at Gatwick — Weather Engineering's N139HH.

Above right: Spantax DC-7, EC-ATQ, with BUA Britannia, G-APNB, in the background.

Right: One of the first batch of Ambassadors purchased by Dan Air, G-AMAH, at Gatwick in August 1967. All photos: Terry A Brown

these entering service at Gatwick on 15 March 1960. During the summer period the Ambassadors flew holiday charters to Berlin, Frankfurt, Hamburg, Stockholm, and Gibraltar. The first scheduled service to Jersey was also started during that summer of 1960. By the middle of 1963 Dan Air had added a further four Ambassadors to their fleet, these being G-ALFR, G-ALZN, G-ALZO, and G-ALZY. The type was then flying most of the airline's inclusive tour operations, serving Amsterdam, Basle, Madrid, Milan, Munich, and others. Another Ambassador frequently seen at Gatwick was G-ALZP of the Decca Navigator Company.

Dakotas, in addition to those of Dan Air, were also regular visitors,



notable examples being British Westpoint's G-ALYF *Sir Francis Drake* and G-APML of the Martin Baker Co while from Rousseau Aviation F-BAXR and F-BNPT were often seen. A rarer example was N 139 HH of Weather Engineering. The Gatwick-based Morton Air Services used G-AMHJ, G-AMSV and G-AOUD operating frequent passenger and freight services to the Channel Islands. Irefly was another small company operating the DC-3 from Gatwick; formed in February 1966 with one Dakota, G-AMPY, they later acquired two further aircraft, G-ALYF and G-AMSH, and all three were operated on charter and freight flights.

The occasional Lockheed Constellations appeared, notably

those of Ace Freighters, including G-ALAK, G-ALAL, and G-ANTF. Luxair operated flights with their Super Stars and N8662 and N9639Z of American Flyers Airline also visited. Military aircraft featured regularly in the movements, particularly with the run-down of the civilian trooping contracts, and the RAF flights were made with Comets and Britannia's.

Among the overseas air arms, aircraft of the Royal Canadian Air Force were some of the most regular military visitors to Gatwick, frequent flights being conducted in support of their NATO-assigned forces. The mid-1960s saw flights by camouflaged Bristol Freighters including 5700 seen in 1965, a number of immaculate

C-47's including KG828 and KN291 were also used. On most Saturdays two and sometimes three C-130's would visit, staying only long enough to unload supplies, refuel, and take on more freight or passengers; aircraft noted included 10306, 10308, 10311, 10314, 10315, 10318, 10322, 10324 and 10326. A less frequent visitor was the Canadair Yucon, and an even more exotic type was one of the first CAF DH Buffaloes, No 9461. Among the many other transient military types were US Army Beavers, Belgian Air Force Pembroke, Finnish Air Force DC-3's and Australian and Iranian C-130's.

Turboprop aircraft were much in evidence during the mid-1960s, the Britannia's of British United appearing in their new colour scheme during this period. Another major operator of the Britannia was Caledonian Airways. Based at Gatwick since November 1961, Caledonian had previously used Douglas DC-6s and -7s mainly leased from the Belgian airline Sabena. They acquired their first Britannia, G-AOVI, in December 1964 and by the following summer had a further two in service, G-AOVH delivered in March 1965 and G-AOVJ in April 1965. A total of nine was eventually to see service with the airline, replacing all the DC-6s and -7s which were returned to Sabena. The Britannias were used mainly on the transatlantic group charter flights, and

in 1966 some were rostered on the Zambian airlift ferrying essential supplies to Dar-es-Salaam and Lusaka.

Two other Gatwick based operators of the Britannia were Transglobe Airways and Donaldson International. Transglobe Airways numbered G-ATGD, G-ANCL, and G-ATLE among its fleet and also negotiated for a number of CL44s. Although Donaldson International Airways Ltd was formed in 1964 its initial service was not flown until as late as April 1969, because its first aircraft had been leased to Lloyd International. Among the foreign operators was African Safari Airways which employed 5X-UVH and 5Y-ALP on tourist flights from Gatwick to East Africa, although personnel and equipment was supplied by International Aviation Services.

Handley Page Heralds and HS748's were present though in smaller numbers, the Heralds being mainly those of British United Island Airways (BUIA — later British Island Airways) and including G-APWE, G-APWF, G-APWG, G-APWH, G-APWI and G-APWJ. Overseas visitors included HB-AAL of Globeair, the Swiss operator, and F-BOIZ of Europe Air Service.

Completing the turbo-prop scene at Gatwick, of course, were the fairly large number of Viscounts. Regular services from Gatwick were run by BEA and a few of British United's also lingered until early-1969 when they were finally replaced by BAC One-Elevens. Other Viscount movements included those of Invicta and British Midland Airways as well as the less well known G-ATVE of the short-lived Treffield International. Interesting overseas examples were provided by SE-CNL of Falconair and HB-ILR of SATA.

By 1966 jet aircraft were beginning to appear at Gatwick in ever-increasing numbers, heralding the end of the DC-6 and -7 era. Apart from British United with its BAC One-Elevens and VC-10s, Dan Air started to receive its first Comet 4s — the earliest deliveries being G-APDK and G-APDO from BOAC in May 1966. After considerable work converting them to higher density seating for tourist operations they entered service in late-1966. Two further Comets

were added in 1967 when G-APDJ and G-APDN were received ex-BOAC and eventually Dan Air was to own no less than 44 Comets. By 1969 the airline had added three BAC One-Elevens to the fleet these being G-AXCK, G-AXCP and the ex-British Eagle example G-ATPL. Many of the overseas tour operators were also starting to replace their ageing piston-engined and turbo-prop equipment, SAM for example, re-equipping with ex-Alitalia Sud Caravelles, including I-DABL, I-DABT, I-DABV, and I-DABW. Bulgarian Airlines' modernisation programme involved the replacement of their Il 18's by the more up-to-date Tupolev Tu 134s while Tarom substituted the BAC One-Eleven for its Il 18s. Spantax and Balair had started to receive Convair 990 Coronados that had previously seen service with their own state airlines of Iberia and Swissair. Ariana was one of the first small operators to receive jet equipment, replacing one of their DC-6s with the ill-fated Boeing 727, YA-FAR: after the loss of this aircraft on the approach to Gatwick they received Boeing 727 N690WA on loan from World Airways.

After the extension of its runway, first to 8,200ft and later to 10,000ft Gatwick became capable of receiving the largest jet aircraft then coming into service and accordingly attracted interest as a UK base on the part of many North American charter operators including Saturn Airways, Trans International Airways, and Capital Airways — all operating the latest Douglas DC-8-61s. Recent and familiar names on the Gatwick schedule have included World Airways, Overseas National Airways and Wardair of Canada — all operating Boeing 707s and 727s, as

well as BEA Airtours which started services with its Comet 4s.

Among the smaller operators at Gatwick was Airways Training formed originally to provide twin engined aircraft and instrument training to airways standard. In 1966 a subsidiary company Air London was formed to offer executive charters and to supply air ambulance and light freight services using a fleet of Beagle 206s. Another new arrival in early-1967 was Cardinal Airways, its Dove, G-ALCU, being used on taxi services and charter flights. After an accident with this aircraft Cardinal leased another, G-ANMJ, from Shackleton Aviation until their own was repaired.

During this period Gatwick had also built up a very busy light and executive aircraft facility and many varied and interesting aircraft visited to clear customs and refuel, notable examples being the very smart Dove, G-ARDH, of the David Brown Corporation, aircraft of the Philips Co plus numerous Lear Jets, HS 125s, and Gulfstreams.

Even as this is written Gatwick is in the middle of yet another massive construction programme and in the ensuing activity many of the operators have temporarily moved to Heathrow including Tarom, Bulgarian Airlines, and Luxair. When the work is finished and these and other operators return to Gatwick it should once again provide a very interesting airport for the airline enthusiast not to mention, of course, a much improved gateway to and from London and the South of England.

Below: Caravelle I-DABL of the Italian inclusive tour and charter operator SAM. Terry A Brown



airshow '77

Peter R March

A GOOD START to the 1977 air display season with a wide range of events in May was unfortunately marred by the tragedy at Biggin Hill involving Jet Ranger G-AVSN, Tiger Moth G-ANDE and Cessna 150 G-BCXT.

The Gloucestershire Air Day at Staverton on Sunday, 8 May, organised jointly by RAF Innsworth and the Skyfame Museum presented a mixed flying programme ranging from Lightning F6 XR720 from Binbrook to Philip Meeson's Pitts G-BBOH 'Smitty Special'. The Red Arrows gave their usual impressive performance, as did the Euroworld B-17 Fortress (N17TE/485784). An attraction of this annual event is the appearance of the Skyfame aircraft collection in a static display outside of their hangar. Tempest 2, LA 607, which was repainted last autumn while loaned to 41 Squadron, proved to be a centre of attention.

The air display held at Rhoose on the same day naturally included a service participation similar to that at Staverton. Additional items included the Tiger Club and Harvard G-BDAM. Unfortunately Lancaster PA474 missed both displays due to engine trouble en-route which caused a hasty landing at Shawbury. The Battle of Britain Flight is showing Hurricane PZ865 this year, giving LF363 a rest.

Marking the Queen's Silver Jubilee, the White Waltham Air Pageant held

on 14-15 May was a unique occasion somewhat reminiscent of the garden parties held at this airfield 20 or so years ago. Situated beneath the Heathrow approach there had to be a restriction on the type of flying display, leading to a welcome concentration on historic and light aircraft. The combined forces of Leisure Sport, Personal Plane Services and the Shuttleworth Trust meant that aircraft spanning the period from 1909 to the



Staverton (8 May)
Rhoose (8 May)
Biggin Hill (13-15 May)
White Waltham (14-15 May)

Below: Skyfame's Tempest II was a focus of attention at Staverton on 8 May. The aircraft was painted in the markings of 54 Sqn but also carries the Cross of Lorraine insignia of 41 Sqn while the HF-T code was actually applied to a Chilbolton-based Tempest in 1946. Andrew P March

Centre: DH Rapide G-AIDL at Biggin Hill. D A Conway

Bottom: The crew demonstrating this VC-10 at White Waltham made absolutely sure it did not conflict with traffic in the Heathrow approaches! (fly-by continues overleaf....) Andrew P March



present day could be represented. Memorable displays were given by the Triplane and Camel replicas in a mock dogfight, Ron Clear in the Mosquito RR299, Don Bullock in the B17 and Pete Sheppard in the Sea Fury. But pride of place must go to the British Airways VC10 (G-ARVM), demonstrated by a crew from the BA Training Unit at Prestwick and flown literally right down to the aircraft's limits! (as the photos show). The Rothman's team gave a lively final UK display before they are officially disbanded, at least for the time being.

Friday 13 May dawned overcast after a night of heavy rain to herald the 15th International Air Fair at Biggin Hill, Kent, but the sun broke through at mid-morning to try to dry off the famous Biggin Hill 'super mud'. To the aviation enthusiast the variety of light aeroplanes was a delight to inspect and watch in flight.

The clean lines of Rockwell's singles were displayed at the Glos Air/Dismore Aviation stand, while over at the Air Mart company stand were displayed Oldham Aviation's Beech 36 G-BECO alongside Beech 58 G-BESA which was ferried across the Atlantic three weeks previously.

Later, Piper aircraft flew in from Kidlington to swell the Piper range displayed by Express Aviation Services, the Piper agents. These included G-BEIP Archer, smart in white with light green trim, G-BENM — an all white Navajo C and Aztec G-BEJT.

A welcome site was DH Rapide G-AIDL parked out in front of the crowd. The Rapide arrived from Netheravon on the previous day flown by Mr Hood, its new owner, who plans to keep the aircraft at the air-



Top: Euroworld B-17 Fortress appeared at Biggin Hill, Staverton and White Waltham. Andrew P March

Above: Skyfame's Proctor 3 with Sycamore G-ALGX/G48-1 in the background. Andrew P March

Left: Tethered balloon demonstration at Biggin Hill. D A Conway

Top right: German visitor at Biggin Hill International Air Fair was Bellanca Turbo Viking D-EMAY. D A Conway

Above right: The Rockwell Commander 114, G-BEDH, on the Glos Air/Dismore stand at Biggin Hill. D A Conway

Right: Camel replica C1701 taxiing out with assistance at White Waltham. Peter R March



field. Spooner Aviation displayed Enstroms G-BALT and G-BENO whilst nearby Eagle Aircraft Services showed off their Beech 36 G-BEIK.

The Saturday and Sunday air displays, each lasting over four hours, were similar in content to include on Saturday an RAF Hawk, XX161, from No 4 FTS, Valley, the Red Devils Belgian Air Force jet team with seven Fouga Magisters and a brilliant display, with one engine feathered, of Trislander G-BDTS, Britten-Norman's demonstrator which had flown in from Bembridge in the morning with Islander G-BDRV. Esso's red white and blue Cameron balloon G-BEJK was shown to the crowd in a tethered demonstration, bursts of the burner raising its basket a few feet above the ground.

One biplane which stood out amongst the line up of veteran aeroplanes was CASA 131 G-BECW which has been built up from two of the CASA 131s which crashed on their trip from Spain last year. The work was carried out at its base at Elstree, Herts. A brief selection of the more interesting visitors on Saturday was OO-JPC Cherokee Six, D-EIKC Cessna Skylane and immaculate Bellanca Viking D-EMAY.

Airshow '77 compiled from reports by D A Conway, A P March, P Metherell, S G Richards, E A Shackleton and A J Wright.

Continuation of the lo-lo display profile from BA VC-10, G-ARVM, at White Waltham. Peter R March/Andrew P March





RAF on Target in 1977

Martin Horseman

SOME TRULY OUTSTANDING performances by Royal Air Force crews were the principal feature of this year's Strike Command (STC) Bombing and Navigation Competition which once again saw the Vulcan bomber squadrons of No 1 Group, RAF Strike Command, competing against a USAF team flying B-52s from four Bombardment Wings of Strategic Air Command. For only the second time since 1970, the RAF won both the coveted *Blue Steel* and *Camrose* trophies which are open to either Air Force. The competition among the RAF squadrons and crews for the six other awards was equally keen and it reflected a very high overall standard of mission performance. Indeed the 1977 competition results have been described as the best ever seen in the history of this annual event.

The key objective of the STC Bombing and Navigation Competition is to test the operational standards and enhance the competitive spirit of the RAF's medium bomber, tanker and maritime radar reconnaissance squadrons. The contest is designed to assess the skills and capabilities of air and ground crews in as realistic a simulation of operating conditions as can be attained in peace-time. Accentuating the crew rivalries in the competition is the invitation which is extended to Strategic Air Command to challenge for the inter-Air Force 'silverware' at stake — a feat at which, it must be admitted, they have proved to be worthy competitors on uncomfortably numerous occasions in the past. This year, the 'away team' comprised four crews drawn from SAC's 5th, 319th, 410th and 449th BWs all operating the B-52H model of the Boeing Stratofortress. The 'home

Above: Some of the Competition Trophies, from left to right, the *Camrose*, *Sassoon*, *Laurence Minot* (rear), *Armament Officers* (front), *Electronics* and *Blue Steel* Trophies. MoD Crown Copyright

Above right: B-52H, 80-0018, of the 644th BS/410th BW at RAF Marham during this year's competition. Roger Wright.

Below right: Vulcan B2, XL388, of No 44 Squadron at RAF Waddington during the 1976 Competition. Martin Horseman

side' in the inter-Air Force phase of the competition was represented by selected Vulcan B2 crews from Nos 9, 35, 44, 50, 101 and 617 Squadrons of Strike Command.

This year's competition incorporated several changes in format which mirrored the greater emphasis





being placed on low-level bombing as the prime operational task of the RAF's medium bomber force. There was also a requirement to fly sorties with little advance warning which added to the realism of the competition and tested the organisation and efficiency of the participating squadrons. The additional significance low-level missions this year led to a revision of the schedule and, for the first time, all the competition sorties were flown during daylight hours. In previous years the missions had been flown at night, thus occasioning less of an air traffic control task relative to civil aircraft movements but having the twin disadvantages of noise disturbances at late evening or early morning as well as the peace-time constraint of having to fly the night 'low-level' legs of the missions at a nominal 5,000ft. This year's daylight sorties were less restrictive in that the low-level routes were flown at a more realistic height and, in the process, they provided more demanding profiles for radar navigation.

The 1977 competition incorporated two phases; Phase I lasted from 31 January to 1 April and involved all the RAF's Vulcan and Victor squadrons while Phase II was held from 9-16 May with only selected crews from each of the six Vulcan B2 squadrons and the SAC units taking part.

During Phase I, each of the Vulcan B2/SR2 and Victor K2 squadrons was allocated at short notice a specific week in which to complete its competition sorties and every available crew flew one mission. All crews flew a limited astro-navigation stage, the crew scoring the most points for navigation won the *General Precision Systems Trophy* and the total points

of the six best crews in each squadron decided the winning unit for the *Sassoon Trophy*. The Vulcan B2 squadrons flew an extended sortie which included an additional low-level bombing stage with two simulated targets. The crew obtaining the most points from the radar bomb scoring assessments of these attacks won the *Electronics Trophy* and the total points of the six best crews decided the winning squadron for the *Armament Officers Trophy*.

For Phase II each of the RAF Vulcan B2 squadrons entered 3 crews and the SAC B-52s participated from their competition deployment base at RAF Marham. Each crew flew two low-level bombing sorties with three simulated targets per sortie. On the first sortie the crews were alerted through the Readiness States to a Scramble take-off while on the second sortie prior notice was given of take-off and rendezvous times. The mission profiles involved a climb out to high-level followed by a transition to low-level, simulating a descent under radar, a low-level over-sea track to the UK coast and three attacks assessed by radar bomb scoring.

The award of the trophies open to the RAF participants at the conclusion of Phase II was determined by the combination of results from both phases of the competition. The *Bristol Siddeley Trophy* went to the best individual crew with most points from Phase I navigation and Phases I and II bombing while the *Laurence Minot Trophy* was awarded to the RAF squadron with the highest score in bombing and navigation combined.

The two inter-Air Force trophies were decided likewise on the basis of individual crew and team perfor-

mances, specifically during the Phase II bombing attacks. The *Blue Steel Trophy* was awarded to the highest scoring individual crew and the *Camrose Trophy* went to the team of three crews with the most points for bombing.

The accompanying table showing the trophy awards in this year's competition provides an indication of the quite remarkable results, including some perfect scores, achieved by the crews and squadrons of RAF Strike Command. In the navigation stage of Phase I, for example, the crew captained by Flt Lt Turnbull of No 50 Squadron obtained the maximum of 300 points in winning the *General Precision Systems Trophy*. Their achievement was to arrive at the Navigation Termination Point only 0.9 miles adrift from the required position after a navigation leg of over 1,000 miles involving 3½ hours flying and during which no use was permitted of the Vulcan's radar and 'black boxes'. Only astro-positioning and dead reckoning navigation was allowed, the Nav/Plotter, Flt Lt Barnes — whose achievement is particularly reflected in this result — passing steering instructions and timing information to the Captain on the basis of pre-computed data and observations during the flight. The winning crew in the Phase I bombing section captained by the Commanding Officer of No 101 Squadron, Wg Cdr Woodford, also turned in a perfect score of 400 points by securing two direct hits during their bombing attacks — a very creditable achievement especially on the part of their Nav/Radar, Flt Lt Clifford, who is on his first squadron tour and who has been with No 101 for less than a year.



Above left: STC Vulcan B2 landing at RAF Waddington during the 1973 Competition, the last occasion before this year on which the RAF won both the inter-Air Force trophies.
Martin Horseman

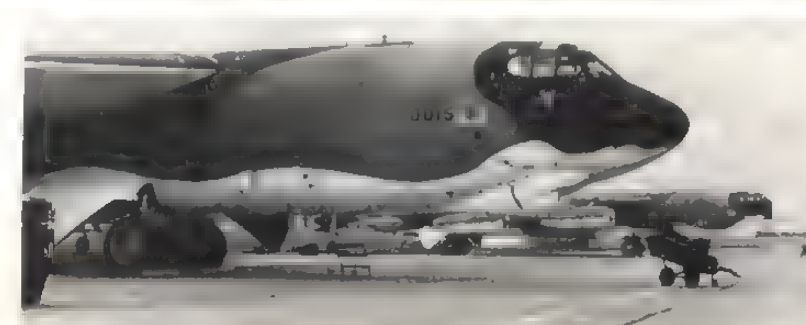
Above: B-52H, 60-0015, of SAC's 410th BW landing at RAF Marham. J G Ewan

Right: Two B-52Hs on the flight line at RAF Marham in May this year.
Roger Wright

Below right: Vulcan B2, XM597, of No 50 Squadron. Roger Wright

Bottom right: Victor K2, XM672 of No 57 Squadron. Roger Wright

The inter-Air Force trophy awards were scooped by crews from No 50 Squadron. Their three-crew team led by the squadron commander, Wg Cdr Ward, took the *Camrose Trophy* by a comfortable 263 points margin, while one of the crews, captained by Flt Lt Scoffham won the *Blue Steel Trophy*. This latter crew, with Flt Lt Taylor as Nav/Radar, demonstrated an excellent accuracy during Phase II by scoring 1,151 points out of a possible 1,200 points in the course of six bombing attacks. This consistency and some fierce international competition was also evident in the other placings for the *Blue Steel Trophy*. Only three points separated the second, third and fourth crews, a SAC B-52H commanded by Capt Houser of the 449th BW scoring 1,111 points, while a Vulcan B2 of No 44 Squadron captained by Flt Lt Milne squeezed into third place by 1,109 points from a B-52H of the 410th BW with 1,108 points.

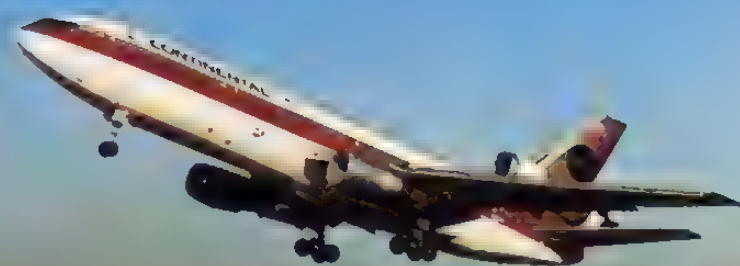


Trophy	Winners	Max Points	Points Scored
Phase I			
General Precision Systems Trophy	Flt Lt Turnbull & Crew of No 50 Sqn	300	300
Sassoon Trophy	No 9 Sqn (OC Wg Cdr Turner)	1,800	1,447
Electronics Trophy	Wg Cdr Woodford & Crew of No 101 Sqn	400	400
Armament Officers Trophy	No 617 Sqn (OC Wg Cdr Gilvary)	2,400	2,142
Phase II			
Blue Steel Trophy	Flt Lt Scoffham & Crew of No 50 Sqn	1,200	1,151
Camrose Trophy	No 50 Sqn team (OC Wg Cdr Ward)	3,600	3,293
Bristol Siddeley Trophy	Flt Lt Bennett & Crew of No 35 Sqn	1,900	1,702
Laurence Minot Trophy	No 50 Sqn (OC Wg Cdr Ward)	7,800	6,348

Long Beach Livery

747-100 Series 81 for Thai Airways International

Photographed by Douglas A. Smith Company, Los Angeles, California



THE LAST TEN YEARS have seen electronic warfare (EW) moving rapidly to the forefront of defence technology development as Western military establishments sought to counter the problems posed by missile-armed defences and probed vulnerable links in communications and radar systems. EW, however, is far from being the novelty which modern terminology implies. Work in this field prior to and during World War II led to a formidable array of Allied and Axis operational facilities, for example; ground, ship and airborne radars; navigation and bombing aids; jamming transmitters and devices such as 'window'; missile guidance and control systems etc, etc. Nevertheless, the scope of EW has expanded enormously since WW 2 with the initial impetus provided by the surface-to-air and air-to-air missile threat to the nuclear deterrent bomber force. More recently, the significance of EW has been amplified by US experience during the air war over North Vietnam and by the impact of radar and missile systems on the course of the October 1973 war in the Middle East.

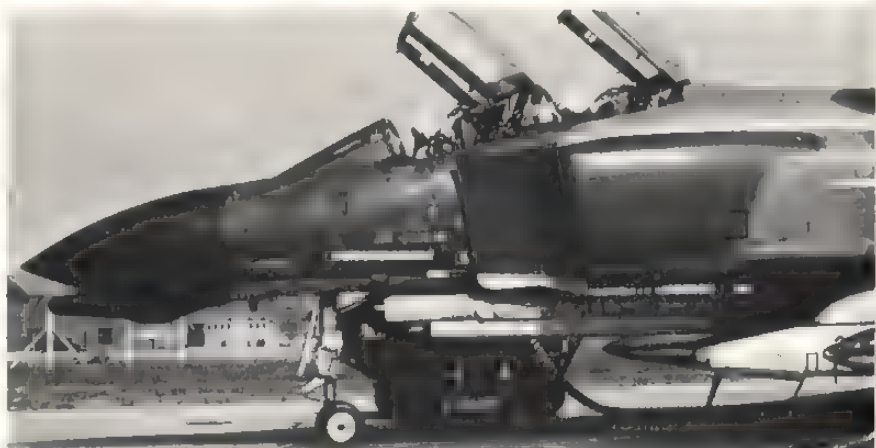
Given the crucial role which EW has come to play in supporting the effectiveness of all military forces, it is not surprising that much of the detailed activity remains shrouded by security. Under the circumstances it is astounding just how much information has been available from military/industrial sources although the examination of this material has invariably involved a painstaking research task. Anyone with an interest in military airpower and avionics can now save themselves much of this time-consuming effort by referring to an established annual handbook* which gathers an enormous amount of background into a remarkable com-

***The International Countermeasures Handbook.** Edited by Harry F Eustace. Published by EW Communications Inc, 3975 East Bayshore Road, Palo Alto, Ca 94303, USA. Prices for 3rd Edition, 1977-78: \$35 (soft cover) \$50 (hard cover) by surface mail. Air mail postage to Europe \$7.50 extra (soft cover) or \$10.00 extra (hard cover). Prices are for prepayments; after-delivery payment at surcharge of \$2.50 per copy.

Through the EW Clutter



Left: NATO version of the Westinghouse jamming pod, AN/ALQ-101(V), fitted to an RAF Buccaneer.



Below left: USAF standard jamming pod, AN/ALQ-119(V), on an F-4D Phantom of the 81st TFW.

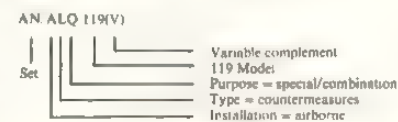
Below: Much-modified nose configuration of a B-52G from the 42nd BW incorporating EW sensors, antennae and the forward-looking Electro-optical viewing system (Low Light TV and Infra Red) on the underside of the nose.



pilation on the subject of EW. This volume is **The International Countermeasures Handbook** published by EW Communication Inc, the publishers of *Electronic Warfare Magazine*. The 1976-77 edition has 666 pages and is packed with information not only on various aspects of the EW inventory in the West but also on results of developments in Soviet EW technology. Some 60 pages of the handbook are taken up by a well-illustrated summary of Soviet ground-based, naval and airborne radars, antennae, avionics and EW stores, missiles and platforms, complete with frequency data, code name lexicons and system descriptions.

Not unexpectedly the bulk of the handbook is devoted to a study of EW systems developed for US armed forces. There are 12 major sections in

the book dealing with equipment and technology as well as several very useful guides to EW nomenclature, lexicons of code names, systems descriptions, glossaries of terms and a 14-page bibliography of further reading on EW. With such a mass of data available it is difficult to pick out particular highlights. Especially interesting, for example, is the equipment section which includes an explanation of the designation codes used for US EW systems bearing the AN prefix: eg the frequently seen AN/ALQ-119(V) USAF standard jamming pod incorporates the following assignments



AIRCRAFT ILLUSTRATED

The equipment indicators guide shows how the first letter after the oblique in the assignments refers to platforms (aircraft, submarines, RPVs, etc), the second to types of system (radar, data processing, radio, armament, etc), and the third to purposes (fire control, bombing, computing, navigation aids, etc). The guide is accompanied by an alphabetical listing of equipment showing the armed service involved, platforms, contractors and equipment description/status (eg the AN/ALQ-119 is shown as a 'multi-band smart pod' for USAF attack aircraft by

Westinghouse) and a glossary of technical definitions. In the section following this, avionics and EW stores deployed on individual US aircraft and helicopters are listed together with 'programme notes'. For the various versions of the F-4 Phantom, to take one example, there are over 40 items of equipment listed varying from the AN/ALQ-10/11 multimode missile fire control system to various chaff dispensers, radar warning receivers, jamming pods, target designators, infra red detectors and so on.

The proliferating code names, such as Compass Tie, Pave Penny, Iron Hand and LAMPS, used by the US services and others to describe EW systems are referenced in a separate lexicon and there is also a 15-page glossary providing definitions of EW abbreviations and terminology. This latter feature not only includes identifications of the abbreviations but explanations of equipment purposes and designs.

Although the content of the handbook is in certain parts definitely directed towards the specialist reader, it has an overall utility which ought to command a much wider appeal. The undoubted current and future importance of EW in the context of airpower strategy and tactics makes this handbook an essential reference and one to keep within immediate reach as a means of charting a clear path through an increasingly complex subject. MH

US Navy EA-6B Prowler from VAQ-132 shown aboard the USS *Independence*. Visible in this view are the underwing highpower noise jamming pods (AN/ALQ-99) the spear antenna on the outer pylon for the DECM jamming system and the fin radome of the Systems Integration Receiver (AN/ALR-42). Martin Horsman





Left: Four AV-8A Harriers of VMA-231 being spotted for the next launch.

Opposite page, top: A-7B Corsair of VA-155 positioned on left cat as F-4N Phantom of VF-111 moves forward to take the right-hand catapult.

All photos: Gordon Bain

Below: AV-8As of VMA-231 ("Ace of Spades") aboard the USS Franklin D. Roosevelt.

CARRIER HARRIERS

Gordon Bain

THE INITIAL DEPLOYMENT of a fully operational Harrier unit aboard a US Navy carrier was marked recently with the inclusion of the Marine Corps' VMA-231 in the air wing assigned to the USS *Franklin D. Roosevelt* (CV-42). Although the Harrier has been to sea on many earlier occasions with the Royal Navy and US Navy, this was the first time that the V/STOL aircraft has been integrated into front line carrier operations at squadron strength. This aviation first has been achieved during what could well turn out to be the last cruise of the *Roosevelt* so an invitation to see the operations of VMA-231's Harriers was doubly welcome since it offered perhaps a final opportunity to visit the carrier too.

The USS *Franklin D. Roosevelt*, or 'Rosey' as she is known to all on board, is now in her 32nd year, having been launched on 29 April 1945. The carrier was commissioned six months later with the result that it was just too late to see active service in World War II. The ship was second to be built in the *Midway* class and was originally designated the USS *Coral Sea*; this name was switched to the third ship of the class, however, when it was decided to re-name CVB-42 in honour of

President Roosevelt who died shortly before the carrier was launched. The suggestion to name the new carrier after the late President was made in a letter from the Secretary of the Navy, James Forrestal (himself later honoured in the naming of carrier CVA-59), to FDR's successor, Harry Truman, who returned the letter three days later with the simple annotation 'Meets my hearty approval'. So carrier hull number 42 acquired its name but another two decades were to pass before the *FDR* finally got an opportunity to show what she could do. In August 1966, the carrier arrived on "Yankee Station" in the Tonkin Gulf at the start of a Western Pacific deployment in support of 7th Fleet operations off Vietnam during which 7,000 sorties were flown in 93 days on station. But time has begun to catch up with the carrier and now well into her third decade, 'Rosey' is due to be decommissioned in the near future. The ship is just not big enough to cope with the new classes of fighters now in service and on the design boards (e.g. F-14 and F-18) and the cost of yet another refit is prohibitive when compared to any advantages there may be.

Still it was with much anticipation and satisfaction at the chance to go aboard the *FDR* as well as to see the operations of its Harrier-equipped air

wing that I left Naples, in March of this year in a C-1A Trader to fly on to the ship while it was cruising in the Mediterranean.

We departed Naples at 10.00 in the morning for a flight of 2hrs 15min to a position south-west of Sardinia where the ship was steaming east. Having nothing to look at except lots of water, I took the opportunity to catch up on 36 hours of lost sleep. As a result, the first I knew of our arrival was when we started our descent from a 10,000ft cruising altitude to a low-level holding position on the starboard side of the carrier. I had to wake up to relieve the pressure in my ears. After holding for a short time, to allow the completion of a launching cycle, the under-carriage came down and I braced myself for my first carrier landing. Part of the briefing before landing was to remove "glasses, false teeth, glass eyes, wooden legs etc." for the arrival. They may have been joking but there was certainly a serious side to it as we were decelerated from 70 knots to zero in a distance of 100ft. The seats in the C-1A face to the rear and absorb the deceleration but things can still break loose. After folding our wings and being spotted in front of the island I was ushered to my cabin and met my escort for the day who was the ship's electronic warfare officer — Lt Tom Fath. Within an hour I was back on deck complete with cameras to see the start of a new launch cycle.

Compared with more recent carriers in the *Kitty Hawk* and *Nimitz* classes the *FDR* is quite small, being 999ft 6in long, 183ft wide with a displacement of 67,000 tons and carrying 4,000 men.

Even so, the ship is sufficiently large to accommodate a sizable air wing. On this cruise, the wing consisted of two fighter squadrons of F-4N Phantoms (VF-111 and VF-51), three squadrons of A-7B Corsairs (VA-153, VA-155 and VA-215) some of which

Right: A-7B of VA-215 taxis through steam from a previous launch as VF-111 Phantom winds up to full power on the left-hand catapult.

Below: Phantoms of VF-51 and VF-111 on the hangar deck. Gordon Bain

are equipped as tanker aircraft, the squadron of US Marine Corps AV-8A Harriers (VMA-231) and also the non combatant types which include the E-1B Tracer, SH-3G Sea King (for plane guard duties) and the Carrier on-board delivery (COD) C-1A Trader. The squadron of A-6 Intruders normally embarked was replaced on this cruise by the AV-8As of VMA-231.

The weather could only be described as perfect when I returned topside and reached the catwalk behind the Captain's 'office' to see the start of a new launch cycle. The AV-8As were the first to go, starting under their own internal power and thus doing away with the external power units needed for the F-4N and A-7B. The aircraft taxied out, two at a time, in line astern, to a position abeam the island from where they carried out a STOL take off, departing at 15 second intervals. The USMC (and the RAF) use this method in preference to a VTOL procedure as it allows the Harriers to take-off with a greater load and consume less fuel. For the STOL take-off a required airspeed is calculated, taking into account the weight of the aircraft and the air temperature. This works out at about 50-60knots. A 'bug' is then set on the nozzle lever. This is the minimum speed and the correct nozzle angle for a STOL take-off. The 'bug' stops the nozzles moving past the optimum position. On reaching the calculated airspeed the pilot can rotate the nozzles at any time he wishes to get jet lift as well as wing lift.

With the departure of the Harriers, there was a sudden increased in deck activity as the F-4Ns and A-7Bs were readied for launch. The noise-level on deck also increases appreciably and a set of ear defenders is a must — there's no noise lobby on this ship. The engines of the Phantoms and Corsairs have been running for some time prior to the AV-8As taxiing out and, to accelerate the launch, there are usually a couple of aircraft already spotted in front of the island to taxi straight on to the catapults. As the last



AV-8A departs, there are aircraft moving up from the rear of the ship to join those already positioned near the island.

With the first aircraft on the right hand Cat 2, the blast deflector goes up and the pilot, after checking the aircraft's weight with the deck crew, completes his checks and winds on full power. When he is ready to launch, he salutes the Flight Deck Officer (FDO) who then touches the deck with his hand. This is the signal to the crew operating the catapult to launch. A couple of seconds later the aircraft is accelerated from a standstill to 160 knots in a distance of 200ft. The acceleration is strictly controlled and varied so that no excessive 'G' forces are applied to either pilot or aircraft. After pulling his eyeballs from the back of his head, the pilot climbs away normally. 200 gallons of water, converted to superheated steam, are needed for each launching. In the event that the pilot turns down the launch, he shakes his head slowly at the deck crew but keeps his engine(s)

running at full power until he gets an acknowledgement from the deck and catapult crew. This maintenance of full power until the catapult is secured is purely a safety measure in case someone get the wrong idea about the pilot's intentions.

With that aircraft gone, the blast deflector, which has water flowing through it to stop it becoming red hot, is lowered to allow the next aircraft to taxi on to the Cat. Meanwhile the aircraft strapped to the other cat is winding up for launch. The same procedure follows as before and, with a roar, it too is blasted into the air. The movement rate is two aircraft per minute.

Before the aircraft have even started, the take-off weights for each have been calculated and passed to the deck crew (who must have one of the world's most dangerous jobs) and also to the crew operating the catapults. Both crews also have a record of the order of departure. When the aircraft arrive on the catapults their weight is double checked with the deck crews

who then confirm it with the cat crew. The knowledge of the correct weight is essential because of the need to have the proper pressure in the cat. The wrong pressure means either too much acceleration and therefore too much strain on the aircraft and crew or not enough acceleration resulting in a 'soft shot' and possibly a very wet aircraft as it lands in the sea.

With the launch complete it is time to recover the previous launch and the activity rapidly changes from the bow catapults to the arrestor gear at the stern of the ship. Formations of two, three and four aircraft have been holding on the starboard side of the carrier awaiting completion of the launch. The first to land have started a wide left-hand circuit of the ship.

With hook and undercarriage down, the approaching aircraft turns on to finals at a range of about two miles to fly down the 'meatball'. The 'meatball' is a gyroscopically stabilised system of lights which give the pilot glidepath information in a similar manner to the VASIS seen on airfields. Having spent many years at civil airfields where the norm is a 3 degree glidepath, these aircraft all seem too high to me on their 3½ degree glidepath, such is the difference that ½ degree makes.

Most aircraft make a successful approach but, just occasionally there is a 'bolter' when one misses the wire. Having to make a go-around after a non-arrested touchdown should be no problem because the landing procedure is for the pilot to apply full power the second he feels the hook touch the deck just in case he happens to get a 'bolter'. Jet engines take a short time to wind up to full power. If the pilot misses the wire having not already selected full thrust it is already too late; he will probably have to eject.

As the first aircraft is brought from 160 knots to zero in 200ft (eyeballs on the windshield this time) the next aircraft is about to turn finals. After being pulled backwards, to release the hook, the aircraft taxis to the forward part of the ship to be spotted, at the same time folding its wings to create more room on a soon to be crowded deck. While this is going on the next aircraft is lining up astern of the ship and awaiting a 'green deck' as the wire is retensioned and the Landing Signals Officer (LSO) checks that the hook

and gear are down. If the pilot still has a 'red deck' when he get to his decision height he must overshoot as it is not safe to land. All the approaches are recorded on video tape for any subsequent analysis, as is the R/T.

Meanwhile, up in PRI-FLI, the ship's control tower, the activity is quite intense. For such a small room there are an awful lot of bodies doing an awful lot of work. Probably the most important, during routine landings, is the officer recording the landing order. From this information is extracted the aircraft's type and landing weight. As in the case of the launching weight, this information is important because the pressure in the arrestor gear has to be regulated to suit the type of aircraft. A much higher pressure is required to stop the heavier F-4N than the A-7B. If the system is pressurised for an F-4 and the next to land is, for example, a C-1A the rear end of the aircraft would be overstressed and could conceivably be pulled off, not to mention the effects on the crew. If the reverse is the case then there would be one very wet Phantom, and crew, as it falls in to the briny deep. Both are very expensive mistakes.

Other people in PRI-FLI include representatives from each squadron flying. In the event that any pilot has a malfunction in his aircraft, there is someone experienced in that type on hand immediately to give help and advice.

Back on deck, there are four wires for the aircraft to catch. Pilots aim to catch the coveted third wire. All the wires are held above the surface of the deck by metal fixtures in the deck. When the wire is retensioned after a landing it automatically rides up on the guide to the ideal height for the hook to engage it. With the F-4s and A-7s back on board, there is a sudden, and very noticeable, relaxation in deck activity, but the recovery still has a way to go yet.

The first AV-8A is now flying the 'meatball'. The difference in the Harrier approach is that the aircraft decelerate to the hover and put down gently beside the island. This happens at regular intervals until the last aircraft is recovered. To quote someone in PRI-FLI that day "It's much better to stop and land than it is to land and then stop". For all the conventional

aircraft the ship has to be steaming into wind to get a Wind Over Deck (WOD) of about 25-30 knots, but the Harrier can land into wind, crosswind and even with a massive downwind component. It has even been operated off the ship as a matter of course while at anchor in port!

When the F-4s and A-7s land, they are spotted and shut down at the front of the ship before being towed to the rear spots. The AV-8As however, continue running, taxi up to their allotted spots and simply reverse in! This, once again is proving just how versatile the Harrier is and its suitability for carrier operations.

Respotting is a delicate affair as it has a threefold purpose. The aircraft have to be arranged so that the ship is kept in trim laterally, they must be in the correct order for the next departure sequence and, while departing, the ship must stay in trim. The next launch takes place exactly 90 minutes after the start of the previous launch so it has to be right first time or the entire schedule is put out. Trim limits vary from only ¼ degree port to ½ degree starboard.

Operations at night, although more spectacular, are not much different from daytime but there are a few special features which warrant a mention. Marshalling is by hand-held lighted wands and the aircraft take-off weights are checked with the pilots using an illuminated board. Since the FDO cannot see the pilot saluting when he is ready to launch, the pilot must switch on his navigation lights to show he is ready. The launch of an A-7B appears to take on a sense of extreme urgency as the power is wound on against the blast deflector to be followed a short time later by the rapidly flashing nav lights piercing the darkness and then silence as the aircraft disappears into the night. The Phantom take-offs are even more impressive as the deck is lit up by their afterburners' bright orange flame followed by the navigation lights and an incredible roar that has to be heard to be believed. After a few seconds the aircraft is launched and the sea for miles around is illuminated with an eerie orange glow until the afterburner is cancelled.

Then there is the Harrier which, for the first time in its life, is just not spectacular. The centre of the deck is lined

with the deck crew holding the fluorescent wands in the air to give the pilot directional guidance during the take-off run. There is no afterburner and only comparatively dim, steady, navigation lights.

Night-time recovery follows the same pattern as during the day except that the incidence of 'bolters' is greater. At the time of my visit they were flying the first night sorties for a while, in preparation for an exercise the following week, and there were two or three 'bolters' whereas there had been none during the day.

In instances where an aircraft in the recovery phase starts to run short of fuel, and the pilot makes several 'bolters', he can be instructed to abort a carrier landing and head for an airfield

Below: AV-8A on STOL take-off run.

Bottom: VMA-231 Harrier firmly secured to the FDR's flight deck.
Gordon Bain

ashore which has been selected as the diversion airfield for just such an eventuality. If necessary, he can top up his tanks from one of the A-7 tankers which are continuously airborne to meet such contingencies and to cover delays in getting the aircraft landed back on board, for example, in the case of a crash blocking the deck.

The tankers are needed especially during 'Blue Water' operations, the latter term denoting periods when the carrier is in 'oceanic' rather than coastal waters and operating too far from land to designate a diversion airfield. In these instances, eg, crossing the Atlantic en route to the Mediterranean, it's a question of landing on the carrier or nothing!

The US Marine Corps order for the Harrier amounted to 110 aircraft and for USMC service they were designated AV-8A or TAV-8A depending on whether they were single or

two seat aircraft. Four Harrier squadrons were formed and based at Cherry Point which is about 30 miles inland from the Atlantic coast of North Carolina. These four squadrons form Marine Air Group 32 comprising VMA-513, VMA-542, VMA-231 and VMAT-203. The last of these is the training squadron with the TAV-8As.

Some months ago, the aircraft of VMA-513 were embarked on the Helicopter Landing Platform (LPH) USS *Guam*. This was as an initial seaborne assignment prior to a fully operational deployment on board the USS *Franklin D Roosevelt* during a Mediterranean cruise. The squadron chosen for this job was VMA-231 which was formed on 1 July 1973.

The general impression given by the crews — the squadron has 18 pilots on the ship and each has at least 200 hours on the type and some as many as 1,000 — was that they are very happy with the Harrier. It does everything asked of it, is very manoeuvrable and, contrary to some reports, it is not a particularly unreliable aircraft. Around 70% of the aircraft are available at any one time. Considering that the Harrier was not originally designed to go to sea, this is a remarkably good figure.

As a measure of the confidence in the aircraft the USMC sent 13 AV-8As to the independence anniversary celebrations in Kenya on 12 December 1976. On this occasion the aircraft were flown on to the USS *Guam* for the trip through the Suez Canal and down to the Kenyan coast, flying 'Blue Water' operations on the way. This meant a round trip of 5,000 miles with no major spares backing, the aircraft taking only spares essential to the daily operation of the squadron.

One of the expected problems was corrosion. The reason for this is that many parts of the airframe and engine are made of magnesium which just does not get on well with sea water but, surprisingly, there have been very few problems. Part of the reason for this is the excellent maintenance schedule and the fact that each aircraft is treated to a new paint job every six weeks. This is not to say that certain lessons have not been learnt: part of the development of the AV-8B is relying on these lessons.

All aircraft have now been retrofitted with the Pegasus 103 engine which gives the aircraft a very good power/weight ratio with a thrust of 20,500lb dry or 21,500lb with water injection. This high power/weight ratio results in a sparkling acceleration which rather surprises some pilots new to the type who find that they have a bit of catching up to do with the aircraft on take off. Pilots quickly become enamoured of the Harrier and it is not long before they are investigating all the possibilities that the aircraft has to offer.

One of the well publicised abilities of the Harrier is its unique capability to Vector in Forward Flight (VIFF-ing). This involves rotating the nozzles of the engine to produce a thrust vector which, instead of being along the aircraft's axis as on a conventional machine, is at an angle to that axis and results in the aircraft carrying out some rather 'odd' manoeuvres.

Let's take a couple of theoretical examples of the Harrier in combat with a likely adversary — the MiG 21. This is a superior machine in terms of conventional manoeuvrability and speed. Involved in a tail chase, a Harrier pilot can rotate the engine nozzle and get a high lift component which the MiG pilot would find very hard, if not impossible, to keep up with. If he somehow does manage to stay with the Harrier, then there would still be another surprise awaiting him. Full nozzle travel on the Harrier is 98½ degrees. To hover, 81 degrees is selected. This means that there is a further travel of 17½ degrees which will give a rearward thrust vector. Used in forward flight this can result in speed being dumped at the rate of 50 knots per second! There is no way that the MiG could decelerate at this rate and he would very rapidly overtake the Harrier. Using the high acceleration of his aircraft, the Harrier pilot could conceivably find himself in a firing position behind the MiG where he can use his own Sidewinder missiles and become the hunter, having seconds before been the hunted.

In the early days of investigating this capability there were problems with the engines' third stage stators which were never designed for this sort of treatment. Rolls-Royce were quick to solve the problem and

reliability is now less than two premature engine removals every 1,000 hours. At present the maintenance rate for the AV-8A is about eight man hours for each hour flown. This compares with nine hours for the A-4 Skyhawk which will be replaced by the AV-8B (the American development of the AV-8A).

One of the latest modifications on the Marines' Harriers is the adoption of the American "Stencel" ejection seat in place of the Martin Baker unit originally fitted. The Marines are quite happy with the Martin Baker unit and the only reason for the change is that the Stencel seat is more modern. Both seats have full zero/zero capability; that is to say, the aircraft can be sitting stationary on the ground or hovering just above it and it will be safe to eject. The Stencel seat achieves this by having 32 weights attached to the parachute canopy. At the top of the seat's trajectory a small explosive charge causes these weights to fly out and deploy the canopy fully. There are still a few Harriers which do not have this modification.

The Harrier was designed to operate from dispersed sites near the front lines of a battle. Accordingly it has many features not normally seen on aircraft operated from carriers. One of these is its self start capability. Another is its almost complete independence of ground handling services. For example, it can reverse itself into a parking spot with no need for a tractor. Try doing that in a Phantom or a Tomcat! Since it has its own internal batteries it does not need a starter trolley and it can be maintained at short-notice readiness with the pilot strapped in the cockpit listening to the R/T and awaiting a call direct from the Forward Air Controller (FAC). The Harrier can be airborne within 1½-2 minutes of such a call, providing air support within minutes of it being requested and not quarter of an hour later as could be the case with catapult launched types. In this way, by combining the Harrier with the other air wing types, a continuous presence can be kept up in the battle area. Just as the Harrier mission completes its task, the conventional machines will be arriving over the area.

Another advantage of the Harrier is the fact that the wing span is very short and so there is more space on

board ship. The ship does not have to turn in to wind to launch or recover the aircraft. This means a faster turn round time for the aircraft and the ship does not have to leave the battle area to launch and recover.

Although the Harrier is a weapon in its own right, there are times when it will have to operate in conjunction with the other types on board the ship. One example given to me on my stay on board the *FDR* involved all the Harriers and half of the rest of the aircraft on board. One squadron of F-4s, two of A-7s and the single Harrier squadron.

The F-4s would be launched to provide fighter top cover over the target. This would be followed by a squadron of A-7s to provide a feint attack from one side or even the rear of the objective. This would draw the defences away from the direction of the main attack. This feint would be immediately followed by the Harriers and the other squadron of A-7s combining for the main assault. This is only one example of the many variations of attack that can be employed and which depend entirely on the type of target.

The Harrier in RAF service is fitted with the Ferranti FE 541 inertial navigation system. In the USMC variant, however, this has been replaced by the Smith's Head-Up Display and Weapon Aiming Computer (HUDWAC) which is not quite such a complicated piece of equipment. The Marines do not need the facilities of the Ferranti device. Since the AV-8A is primarily a ground attack aircraft it is expected that the HUDWAC will be fitted with the Continuously Computed Impact Point (CCIP) weapon aiming system.

Although the AV-8A Harrier has now demonstrated even greater operational flexibility following its cruise at squadron strength aboard the USS *Franklin D Roosevelt*, the ultimate capabilities of this unique aircraft are still to be revealed. It is being developed by McDonnell Douglas into the advanced AV-8B and by Hawker Siddeley as the Sea Harrier for the Royal Navy and possibly other navies. The USMC alone has a requirement for 342 AV-8Bs and the US Air Force and Navy are also keeping a close check on the Harrier's remarkable progress.





Norman L R Franks

MANY STORIES OF heroism and courage originated from the island fortress of Malta during World War II. The fighter pilot's gallant defence against great odds, the attacks on the ships forming Rommel's supply line by both air and surface vessels or submarines. Of all the stories one which fires the imagination is that of a 22 year old, blond introvert, who apparently while ignoring personal danger became the eyes of the Island and the scourge of the Italians and Germans. He was unorthodox, unpredictable, wore his hair long, earned the total respect and approval of Malta's AOC and became the uncrowned 'King of the Mediterranean'.

These lofty heights were gained from the lowly position of an almost 'washed-out' pilot by the name of Adrian Warburton. 'Warby', as he became known affectionately, came from Middlesbrough. The son of a submariner, later Commander Geoffrey Warburton OBE DSO, young Adrian was actually christened aboard a submarine in Malta shortly after his birth in 1918. Following his formal education he became a bank clerk and in 1937 joined the Territorials as a private in the Royal Tank Corps. A year later he decided to join the RAF being commissioned in January 1939 as 41635 Acting Pilot Officer Warburton, A. He was posted to No 22 Squadron at North Coates soon after the war began. Flying Bristol Beauforts, his record was little more than mediocre and certain of his activities in his private life also gave his CO cause for concern.

King of the Mediterranean

Wing Commander Adrian Warburton DSO and bar, DFC and 2 bars, DFC (US) RAF — 'King of the Mediterranean'.

Therefore, when his Commanding Officer was asked to supply crews to form No 431 Flight to go to Malta and found himself one observer short he 'volunteered' Warburton who previously, his CO was delighted to recall, had completed a General Reconnaissance course.

Malta was fast becoming a strategic centre for operations in the Mediterranean, but to be really effective its aeroplanes and naval units had to know where the enemy's ships were and what they were doing. This required a recce unit, thus 431 Flight was formed on 19 September 1940 equipped with three Glen Martin GM 167F 'Maryland' twin-engined reconnaissance aircraft with a crew of three. The three Marylands flew to Malta via Gibraltar, Warburton successfully navigating his pilot to the island.

Although a pilot, Warburton flew several sorties as navigator to Flying Officer James Foxton, the Flight's main preoccupation being one of locating enemy shipping in and around Taranto, Brindisi and off the Greek coast. Towards the end of 1940, the C-in-C, Mediterranean, Admiral Sir Andrew Cunningham, decided that instead of waiting for the Italian Fleet to come out and do battle with the Royal Navy he would send in the Fleet Air Arm to attack the enemy's capital ships in their harbour at Taranto. The success of this operation depended to a large extent on 431's reports.

Warburton flew 12 operations in October but only half of them as pilot. As early as 10 October five battleships, two cruisers and two submarines were located in Taranto and photographed by the Marylands. Flying in AR707 on the 12th, an Italian fighter attacked them but Warburton's pilot took good evasive action. On the 26th, Warby piloted another Maryland and was chased by an enemy machine. Four days later in company with Sergeants Strong and Moran he visited Taranto and Brindisi being welcomed by heavy AA fire. An Italian seaplane was also encountered and shot down by the Maryland's

gunners. Warby now became a full-time pilot, and flying a mission on 2 November, was attacked by three Fiat CR42 fighters and a flying boat. His rear gunner fired 220 rounds at one of the enemy whose pilot appeared to be hit and the fighter's engine began to smoke. Five days later four Macchi 220s engaged them, one being damaged by the return fire from the Maryland. Their most important mission, however, came on 10 November.

Taking off at 12.20 hours with Sergeants Paddy Moran and F Bastard, they flew to Taranto at sea level, forced down by heavy cloud. The Italians were hardly expecting British machines on such a day and even their balloons were down. Warby flew low around the Gulf of Taranto and over the harbour, his men busily plotting the exact location of every ship in sight. He took them so low and close they could actually read the names on the vessels. Finally desultory fire began to explode about them but Warby flew round again so as not to miss a single ship. As he turned for home a CR42 tried to engage him, chasing the Maryland for 20 minutes. On landing at 16.10, the crew were able to supply the exact locations of five battleships, 14 cruisers and 27 destroyers also forwarding an excellent set of photos to the aircraft carrier *Illustrious*, whose Swordfish crews were to attack the Italian Fleet that night. Thanks to this near perfect report the raid was a great success, half the Italian Fleet being put out of action for the loss of two Swordfish.

On 13 November flying with Sergeant Gingell and LAC Levy, Warby flew a recce to Cagliari, Monserrato, Oristana and Alghero, being chased the whole time by three CR42s and a Macchi. No 431 Flight having really proved its worth in recent operations, fast became an important part of Malta's strength and by December it had five Marylands on charge. Warburton was by far its most aggressive pilot always attacking enemy aeroplanes whenever they approached him. On 15 December he even went down and strafed an Italian submarine he found off Syracuse. On the morning of Christmas Eve during a recce over Naples he attacked a

SM79 three-motored bomber which was shot down in flames. Two days later he was back over Taranto but was chased away by seven CR42s and then had to out-run two Macchi 200s that were patrolling three miles off Malta's Grand Harbour, apparently waiting for his return to the island.

No 431 Flight became 69 Squadron on 10 January 1941 and also in January Warby was awarded the DFC, while Sergeant Bastard who had flown many sorties, several with Warburton, received the DFM.

Missions were flown regularly over the first weeks of 1941, Warby flying seven in January. Certainly the Italians were very alive to the squadron's activities and intrusions, fighter opposition becoming much stronger. On 7 March for instance while over Taranto, four Macchi fighters chased him out and over the Adriatic while on the return flight to Malta two more attacked but the Maryland out-distanced them. Ten recce sorties were flown by him in April, then in May Sergeant Paddy Moran received the DFM. The following month Sergeant R V Grindley, another NCO who had flown several sorties with the blond pilot also received the DFM.

With Moran and Bastard, Warby carried out a recce of the aerodromes at and around Tripoli on the afternoon of 20 June. Flying over the airfield at Misurata, Warby made an attacking run on several SM79s on the field. With no opposition from the ground defences, his fire set ablaze three of the bombers, also damaging several others. Four days later, he flew a sortie on his own, flying for the first time a Hawker Hurricane (V7101), making a recce of Catania. This same day a convoy of enemy ships was found by

69 Squadron who then carried out an attack on them on the 25th. The Marylands found the four merchant vessels escorted by seven destroyers. One Maryland was shot down but Warby managed to place a 500lb bomb on one of the ships.

Warby was out in a Hurricane again three days later over Comiso. An enemy aeroplane took off to intercept him but rapidly sheered off when Warby turned to engage. Warburton's Maryland, which was affectionately named *The Sardine Can* by the crew, was attacked persistently by a Macchi during a recce of Tripoli on 9 July, the Italian putting a couple of bullets into the Maryland's starboard wing. Sergeant Wilkins, acting as rear-gunner, finally hit the fighter which was last seen diving steeply, pouring out black smoke. With Moran and Bastard during a morning show over Taranto on the 22nd, they were attacked by a Cant Z506 on the return flight, 15 miles east of Syracuse. Warby attacked the big seaplane which returned fire but then promptly went down and landed on the sea. Diving down, Warby strafed the machine setting it on fire and later Malta intercepted an Italian radio message reporting two airmen as killed.

To Air Marshal Hugh Lloyd, the AOC on Malta, Warburton could do no wrong, his flamboyant yet individualistic style obtaining the much needed results. In fact most of the squadron's crews were individuals and now the Marylands began to carry bombs on their sorties adding thus physical damage to the enemy. Warby dropped two 500lb bombs among buildings at San Giovanni on 9

Below: Martin 167F Maryland recce aircraft of the type used by 431 Ft, later 69 Sqn, Malta 1940-1944.



August, just before he received a bar to his DFC.

Flying a patrol over the Tunisian coast on 7 September, Warby spotted seven twin-engined aeroplanes which, closing with them, were joined by two SM79s. Warby took his Maryland in close, making in all five stern attacks firing into the formation from 800 to 1,000 yards. While he could make no definite claims, he was certain he hit several of the enemy machines. They were more successful on the 24th after a patrol over the Ionian Islands. They found a convoy being given air cover by an SM79 and a Cant Z506. Warby attacked the Cant which was forced down on to the water. The crew rapidly climbed into a dinghy seconds before Warby strafed the seaplane and destroyed it.

Their last successful combat was on the morning of 29 September 1941 while patrolling Marittimo. The Maryland was attacked by a Macchi 200 which Sergeant Moran shot into the sea. On 1 October, Adrian Warburton was posted to Middle East Command for non-operational duties, followed by a posting to No 2 PRU in December.

While resting in Egypt he flew a Baltimore aircraft, not liking it as much as the Maryland, but he took up a Beaufighter and judged this a better machine to use against the enemy. He returned to Malta and to 69 Squadron on 11 August 1942 ferrying in a new Spitfire for the squadron (BP911). The squadron now consisted of three flights, A flying Baltimores, B led by Warburton and flying Spitfires, and C Flight equipped with Wellingtons.

He flew his first Spitfire operation the day following his return, a photo-recce sortie to Taranto, photographing four battleships, two destroyers, two tankers and two merchantmen, from 21,000ft. Warby continued to fly the Spitfire for the rest of 1942 and into early 1943 flying mission after mission in search of enemy convoys, photographing enemy bases in Sicily, Italy and North Africa. As Malta's air forces began to hit the enemy convoys with ever increasing success, Warby would fly out with the Beauforts or Beaufighters in his Spitfire to watch the attacks and assess the damage inflicted. When the distance was too great he would fly a Baltimore.

Having been promoted to Squadron

Leader on his return to 69 Squadron he was very much one of the senior pilots on the island, especially in experience. On 23 August he was sent out searching for an oil tanker in the Corfu Channel, and found several ships and two Cant Z506s on the water. As he took his photos he was attacked by two CR42s but managed to evade their passes. Two more fighters pursued his Spitfire over Sicily on 4 September but again his skill got him out of trouble. Two days later he took off at 07.30 and successfully located a convoy of ships which had been in Brindisi harbour. The ships had been under constant observation during their stay in Brindisi but had slipped out and away under the cover of darkness. Landing back at 11.10 he reported his discovery, then flying a Baltimore (AG726) flew out at 12.50 with the Beauforts. He observed the attack on the four MVs and eight destroyers, seeing one hit on No 4 MV which burst into flames, and thought a second ship was damaged. He landed back at 18.05 after a long day. In October he received a second bar to his DFC.

On 14 October in his Spitfire (BR665) he watched the Beauforts of 227 Squadron attack another convoy but he was attacked by four Macchi 202s, one persistent Italian getting on his tail four times before finally being shaken off. However, he did see one of the torpedo bombers hit and go down, its crew clambering into a dinghy. Warby circled the men until a rescue vessel reached them guiding the boat to the downed flyers.

Over Tunis on 12 November he was attacked by two Me109s but was not hit but three days later his machine (BR646) was hit by other 109s over Bizerta. His oil feed was damaged and compass smashed. With oil leaking from his engine he flew towards Bone, the last part of the flight with no oil pressure showing at all. Force landing at Bone his engine was a write-off! Five days later, the 20th, he was promoted to Wing Commander and celebrated in a most unusual way the next day. Taking delivery of a new Spitfire (ER674) he took-off from Bone at 07.50 to return to Malta. Ten miles off Zamba he found two Ju88s flying south at 1,000ft. Warby attacked the rear one setting its port engine and wing on fire,

the wing tearing off a few moments later. Turning, he fired into the second Junkers but his cannons packed up and he could only claim a 'damaged', as it was lost in cloud. He returned to Malta in triumph but was back in the air two days later successfully evading more Me109s and heavy AA fire during a recce sortie over Tunis and Bizerta.

The year of 1943 still found Warburton with 69 Squadron on Malta flying almost at will in his Spitfire over Naples, Palermo and other Italian towns. At the beginning of March, the squadron was totally equipped with Baltimores, but by this time Warburton had left, being given command of 683 Squadron. No. 683 was in fact formed on 2 February 1943 from B Flight of 69 Squadron, the Spitfire Flight having been extended to a full squadron status.

During his time with 69 Squadron he had been given almost a completely free hand. Hugh Lloyd recalled that Warburton reminded one of Lawrence of Arabia being as unorthodox and as personally complicated as the famous man of the desert. Warburton was supreme master of the Central Mediterranean, no Italian base, port or harbour was safe from his eyes and cameras. Although constantly surrounded by anti-aircraft fire and chased by enemy aeroplanes he seemed to bear a charmed life. He was infamous for his informal, even scruffy dress. More often than not he would be found in his off duty moments down at the flights, playing cards with the men or helping with work on the engines and aeroplanes. His name was legend on the island and was at one time credited with more Italian aircraft destroyed or damaged than any of the fighter pilots flying the Hurricanes.

Now with 683 Squadron, Warburton and his pilots began to fly at high levels on the majority of their sorties but the targets for their cameras remained the same — Taranto, Palermo, Messina, Naples and all received equal attention. AA fire and fighters still had to be contended with but he always returned with his photographs. Spitfire IXs began to arrive in April, Warby flying EN391 on the 26th at 23,000ft over Sicily.

Then Warby began a series of 'special' low-level missions all at approximately 200ft and all over or

around Sicily — it was his part in the prelude to the Allied invasion of Sicily which began on 10 July. On 22 July he was attacked by four 109s off Cape Sile but again evaded his enemies and made his way home. In August he and his pilots were ranging over the Italian mainland and on several occasions 109s chased him but always he got away from them. However, his time was running out after nearly three years' of operations from Malta and it was time for a break. His last sortie with 683 came on 6 September 1943. Taking-off from Luqa at 06.50 he flew at 27,000ft over Dubrovnik and Durrizzo, landing back at Lentini four hours and ten minutes after take-off at 11.00.

Instead of resting, Warburton began to fly and co-operate with American forces. His outlandish dress and untypical RAF style endeared him to the Americans and they let him fly their PR Lightnings. On one occasion he set off on a sortie from La Marsa in a P-38 but had engine trouble and had to crash land. Getting clear of the burning aeroplane he was back on the airfield, in another Lightning and away again while some people were still looking for him near the crash. Many of his sorties were flown following American daylight bombing missions and soon he received the American DFC. It was not all one sided, however, for on one mission flying over the American fleet he was shot up by zealous or nervous gunners, landing back on Malta with a large hole on one wing and an aileron almost torn off. His awards continued. He had received the DSO earlier in the year which was later followed by a bar to this decoration.

Wing Commander Warburton was now given command of a PR Wing at La Marsa but a motoring accident in Tunis ended this posting and he returned to England. Recovering from his injury he was grounded, but visited his American friends and on 12 April 1944, borrowed a P-38 for a trip across the Alps to pay a visit to colleagues at San Severo. Taking-off from Mount Farm he went missing, being last seen by an American pilot flying over Lake Constance. Neither he nor his aeroplane were seen again, his loss remaining a complete mystery. Although his story ended that day, his life and legend still remain.

air kits

James Goulding

A new F-16A

AS WAS MENTIONED in last month's column, we have received Hasegawa's new kit of the General Dynamics F-16A in 1:72 scale. It is a typical Hasegawa product — accurate in outline and with a moulding quality of a very high standard.

The F-16 seems to be a kit manufacturers' dream; the main fuselage, wings, tailplanes and fin and rudder can be moulded in seven parts, with smaller components added. Because of the finely faired shape F-16 kits have the fuselage halves split horizontally instead of the usual vertical separation. In this model the pilot's flooring and seat are cemented to the lower half of the fuselage before assembly of the two halves. The instrument panel, for which a decal is included, is cemented to the upper half of the fuselage. The air intake assembly beneath the fuselage is made up from three component parts, the centre portion of which houses the nose undercarriage unit. The moulding of the undercarriage units is delicate. External engraving is typical of Hasegawa's superb standard. This time the skin and panel lines are indented — not heavy grooves, but beautifully fine lines.

A drop tank is supplied for installation under the fuselage, on the centre line. On the wings are four positions for stores, which comprise two ECM jamming pods and two laser-guided 'smart' bombs, while the extreme wing tip positions house AIM-9 Sidewinders. Transfers (decals) are supplied for the first and second prototypes, the first in gloss red, white and blue and the second in off-white and light blue.

Our sample Hasegawa F-16A was kindly supplied by A A Hales Ltd.

A revised Jaguar

Soon after the first Jaguars were revealed to the public and began flying Airfix was quickly on the scene with a 1:72 scale kit of the new ground attack/trainer aircraft. Apart from a peculiar mistake in the fuselage contours near the gun troughs the Airfix Jaguar was quite a good model, but fairly extensive modifications to the Jaguar design during flight trials soon outdated the kit. The intake splitter-plates were removed, the fin height was increased and the fuselage spine was bulged forward of the fin. Further modifications were introduced on the standard RAF single seat version, including the wing fences, the fin-mounted radar warning receiver, ventral fins and the laser rangefinder nose.



Jaguar GR1, XX726, of No 6 Squadron — one of the aircraft featured in the revised Airfix kit. Martin Horseman

Changes were also made to the aerals, to weapon loads and to the tailplanes. All these alterations made the Airfix model only representative of an early prototype. Now, having wisely waited until the type was well established in squadron service, Airfix have completely re-tooled the original kit to bring it up-to-date with the present standard RAF single-seat version.

The new model is a delightful replica, now much-enhanced in appearance by all the various modifications — which make it the most authentic 1:72 scale Jaguar yet available. The fuselage contours have been much revised and the gun trough error corrected. The fin shape has been updated, the RWR bar has been added and the model now has the ventral fins. The Jaguar's appearance was considerably changed on RAF aircraft by the adoption of the wedge-shaped laser nose and modellers wishing to model the Inter national or French versions will have to revert to the pointed nose of the original kit. In this kit the stores have been completely changed from the strange projected missiles, combined rocket pod and fuel tank under the fuselage and under-wing weapons to various combinations of attack weapons. A new under-fuselage centre-line carrier can mount either a large fuel tank or two 1,000lb bombs. The inner pylon under each wing can mount either a single 750lb cluster bomb or a carrier attachment for either two cluster bombs or two 1000lb bombs. Single 750lb cluster or 1000lb bombs can be mounted on the outer pylon under each wing. SNEB rocket pods, such as those in the Airfix Harrier kit, could be used in other weapon combinations if desired.

Two RAF Jaguar GR1s are featured on the transfer sheet, XX726 of No 6 Squadron and XX721 of No 54 Squadron, both in standard Dark

Green/Dark Sea Grey/Medium Sea Grey finish, with low-visibility national markings.

Curtiss A-12 Shrike

Some time ago Rare Planes produced a fine vacuum-formed kit of the Curtiss Y1A-8 Shrike powered by the Curtiss V-1570 Conqueror inline engine. Now they have followed this with a kit of the Curtiss A-12 Shrike, the major difference being the replacement of the Curtiss Conqueror by a Wright YR-1820 Cyclone engine. The big Cyclone radial engine radically alters the appearance of this famous attack aircraft of the US Army Air Corps.

This is an excellent vacuum-formed kit, which has the advantage of being moulded in thick plastic. One of the major problems with thin plastic components is the difficulty of sanding down the mating surfaces. It is easy to produce uneven joints unless the mating surfaces have been accurately sanded. With Rare Planes models the thick plastic makes the work much easier. Sanding down the wing halves accurately can be assisted by taping a wood block to the upper surfaces to provide something to hold and to keep the wing rigid.

Surface detail on this kit is excellent — as good as on many injection-moulded kits. The engine and cowlings are well-moulded and quite satisfactory, but many modellers may prefer to use a Wright Cyclone from a Curtiss Hawk (an excellent use for that Monogram model that the dog has stepped on) or model a YA-10 using the Pratt and Whitney radial from the Matchbox Boeing P-12.

As with all Rare Planes products a fine 1:72 scale drawing of the Shrike is included on the instruction sheet, a reference drawing well-worth filing away. This sheet is on stiff card and also forms a protective packing for the kit.

This is a fine model; it is available from Rare Planes, 69 Redstone Hill, Redhill, Surrey.

ROC Spitfire

Sir,
I was most interested to see the photograph of the 54 Sqn Spitfire on page 210 of the May edition of *Aircraft Illustrated*. My grandfather gave me an identical photograph about two years ago; he had obtained it sometime during the war but cannot recall from whom or why. The negative is without doubt the same, though my photo is less blurred than your enlargement.

I suspect that copies of this photograph were sold fairly widely for fund-raising reasons or perhaps given as prizes in an ROC or Home Guard aircraft recognition competition.

I wonder if any reader can identify the airfield at which the photograph was taken?

KEITH BRYERS
Balloch Inverness-shire

Sir,
I was interested to see the photograph of Spitfire II KL-Z (P7618) in your May issue.

For further information on this aircraft readers should turn to pages 110 & 133 of John Rawlings' *Fighter Squadrons of the RAF* where it will be seen that the aircraft was on the strength of 41 Squadron in the early winter of 1940. It was in fact, the mount (then coded EB-Z) of the CO Sqn Ldr D O Finlay DFC.

In February 1941, 54 Squadron returned to Hornchurch from Catterick taking over some of 41's Spitfires in the process. The photo that you printed was taken in Feb '41 in 54 Squadron markings.

J MENDHAM
South Benfleet, Essex

Sir,
Regarding the letter and photograph in *Aircraft Illustrated*, May 1977, page 210, the photo, possibly an old Air Ministry one, was taken at Hornchurch airfield in early 1941 when this particular aircraft, a mark 2A (serial no: P7666), was with No 54 Squadron.

Earlier it had been with 41 Squadron, also at Hornchurch, and was flown by Sqn Ldr D O Findlay DFC AFC, the pre-war Olympic athlete. Code letters on it at this time were EB-Z. No 54 Squadron had moved to Hornchurch in February 1941 taking over 41's Spitfires. The aircraft was shot down on 20 April 1941 after having just destroyed an Me 110.

F PARSONS
Chief Observer 14 Group, ROC
Southampton, Hants.

Sir,
The excellent picture of a Spitfire Mk II

in the May *Aircraft Illustrated* was thoroughly enjoyed and if it prompts other readers to send in photos with background giving atmosphere, then I am sure it will please many of us specializing in this era.

A couple of points of interest, the presentation adornments plus the two 'Kills' were first seen on the aircraft when flying with 41 Sq. codes EB, a picture can be seen in *Aircam* No. 4, before the aircraft was transferred to 54 Sq. codes KL. The Spitfire was shot down on 20 April 1941, the pilot Plt Off Stokoe being picked up from the Channel.

Finally, can a reader confirm the serial number of this interesting aircraft; it has been stated variously as P7618 & P7666 and the correct one is needed for the record?

R DURAND
Caterham, Surrey

(Many thanks to all our readers who responded to Mr Ron Thompson's letter in the May issue. We are happy to endorse the suggestion in the first paragraph of Mr Durand's letter, particularly if the photographs are of adequate subject sharpness and clarity for reproduction and if they portray interesting background settings—Ed.)

Royal Navy Tiger Moths

Sir,
The *Airview* column in the May issue stirred a few memories, both of the Plymouth Aircraft Recognition Society, and of the Britannia Flight Tiger Moths.

As a schoolboy, I lived next to the airfield at Roborough, and was allowed by the very friendly staff to help clean and look after the aeroplanes, eventually obtaining a PPL on the Aero Club Tigers. I was also a member, and for a year, Secretary of PARS.

With reference to XL715/G-AOIK, I am afraid that it does not exist any more. It was the custom to send the Britannia aircraft, accompanied by a Dominie borrowed from Culdrose station flight, on a summer trip through France each August. On the first of these, Dominie HG709 was written off in a landing accident on its return to Plymouth. I believe that this was on 31 August 1961. The next year XL715 was damaged beyond economical repair in a take-off accident at Angers, France. This would have been August 1962. A Naval party went down in a Sea Prince to salvage anything worthwhile, and returned with the engine, instruments, and tail skid assembly. I believe the rest was left behind. It was said to have been burnt, but I do not know for sure.

BB814 was then acquired from Lee on Solent, as a replacement. The code letters you mention alongside the serials were applied by me, on an unofficial basis, because the pilots were confused by the serial numbers, and kept filling their times

into the wrong servicing forms. Following the loss of BB852, XL717 was sent down from Lossiemouth, and inherited the 'B'. T6296 was supposed to be on loan from Yeovilton, and was marked 'G' so as not to break the sequence, should it have been returned.

I manage to return to Plymouth from time to time to visit my parents, often using for transport Rapide G-AGSH which a group of us preserve in Jersey. I have just acquired a dismantled Tiger Moth to restore and preserve as well. These de Havilland Biplanes are like a narcotic to me!

PETER HARRISON
St Martin, Jersey

Myatery Instrument Panel

Sir,
Recently, in a river in Cornwall, I found a warning notice from an aircraft instrument panel. It measures about 4½in x 1½in, is made of hard black rubber, and is slightly damaged at the left hand edge, this resulting in some of the message being missing. However, the main part of the warning is visible, and is shown below.

OF PROPELLER FEATHERING SHOULD ONLY BE DONE
THE FIRST 4 HOURS OF ANY FLIGHT ON THIS
AFT
ER THIS PERIOD PROPELLERS SHOULD ONLY BE
ERED IN AN EMERGENCY AS UNFEATHERING
OT THEN BE POSSIBLE

The RAF Museum after a search through the operating manuals of British and American aircraft is unable to throw any light on the origin of the panel, or indeed the reason why unfeathering may not be possible after 4 hours of flight.

Perhaps a reader may have some comment on this subject?

R W LIDDIARD
St Austell, Cornwall

UFO the answer?

Sir,
The probable answer to the mysterious type of aircraft seen by Mr F S Iredale (Letters, February 1977) is that it is a UFO.

Conventional aircraft form just as much part of the UFO phenomenon as the saucers, cigar-shaped objects, spheres, etc; people are accustomed to seeing when these mysterious craft appear, which have been plaguing humanity since time immemorial.

Of course, all this will be hotly disputed by the sceptics and cynics, but before dismissing this they would do well to go into it as carefully as possible. After all UFOs have been seen and duly reported by veteran, responsible aircrews apart from police officers, ships' captains, soldiers, etc, etc, the world over, despite most 'Establishments' attempts (including our own), to suppress and play down lots of these well documented reports.

R SHAMA
Herts

IAN ALLAN



DROPZONE NORMANDY

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airbooks

The de Havilland Mosquito by M J Hardy, published by David & Charles. (£4.95)

As the author points out in his introduction to this history of de Havilland's 'wooden wonder', it is far from irrelevant to speculate today on whether the unorthodox concept which resulted in the Mosquito would have stood a chance of realisation if the project had been broached by a nationalised aircraft industry. Such was the unconventional nature of the DH98, that its great success as a cost-effective, multi-role, aircraft was all the more remarkable — especially at a time of accelerating technical development. To take one instance, it remained the fastest RAF Bomber Command type from its operational introduction in May 1942 until the Canberra entered squadron service in 1951.

This book, the third in the publisher's series of Aircraft Family Monographs, is a comprehensive record of the 'Mossie's' development through all the various marks of the aircraft, not only the famous versions built in large numbers but also the less well known variants which fulfilled a range of trials and experimental roles. The especially-useful aspects of the work are the continuation of the story beyond 1945 to ensure coverage of the aircraft's entire career into the mid-1950s and the chapter devoted to overseas production of the Mosquito in Canada and Australia.

Most of the account is naturally taken up with the aircraft's wartime history and having described the flight test programme on the principal marks, the operational deployment of the Mosquito is covered by four chapters which separately deal with the bomber, fighter/night fighter, fighter bomber and high altitude/photo recon versions. Although this means that the story several times proceeds from 1941 to 1945 and back to 1941, and so on, it is a useful way of unravelling the main strands in what would otherwise be a very complex narrative.

The book is extensively illustrated with black-and-white photos which, while mostly clear, are in some cases unfortunately indistinct just when one would like to see some caption-referenced detail (eg pp 34, 61, 74). A distraction which could be usefully avoided in future is the odd employment of rank abbreviations such as Fl Lt and Squ Ldr: Squ is also regrettably used in all the abbreviated references to RAF Squadrons. **MH**

Aircraft in the history of airlines — Volume 6: **SABENA**, published by Luftfahrt-Verlag Walter Zueri (DM7.50 plus registered post to UK DM2.00)

This is the latest in a series of illustrated pocketbooks from the West German

publishers of *Der Flieger* magazine and it follows previous issues on Air France, Pan Am, Lufthansa (2) and Qantas. It comes in a miniature landscape format and it is indeed a handy pocket size measuring 5¼in x 3¼in. The Sabena volume comprises 120pp and incorporates two main sections devoted to an illustrated history of the airline and an equipment summary in which each of the 54 aircraft types operated during the carrier's existence is given a double page entry — the left hand page forming a data panel and the other a full page black-and-white photo of the aircraft.

Overall, the book makes a favourable impression, particularly in view of the excellent quality of most of the photographs. The summary history of Sabena concentrates on the pre-WW2 era and deals only briefly with the post-war expansion of the airline. Although the early material is very interesting, one wonders whether the civil aviation enthusiast might appreciate a more balanced coverage of modern aspects including, perhaps, a complete list of the current aircraft fleet and registrations. **MH**

The Observer's Book of Aircraft — 1977 Edition by William Green, published by Frederick Warne. (£1.10)

This, the latest in the long-running series of *Observer's Book of Aircraft*, is actually the 26th annual edition of a title which has long since become an institution on the air enthusiast scene. The publication retains its established format of photograph, data summary and three-view silhouette and this year these are presented for over 100 fixed wing aircraft on double page entries. Information on helicopter types is presented in a separate section at the rear of the book, each example being given a single page entry without the silhouette drawings.

As before the purpose of the book is to reference new aircraft and variants of existing types which have appeared in the previous year or which are expected to 'arrive' in the year of issue. Particularly topical in this issue, therefore, are the AMST prototypes, the new Soviet entries, the range of maritime patrol newcomers and military trainer/ground attack aircraft. All in all, a continuing and handy reference with an undiminished appeal as the years go by. **MH**

New Zealand Military Aircraft 1913-1977 by David Duxbury and Ross Dunlop, Ross Macpherson & Ross Ewing, published by Aeronautical Press, Wellington, New Zealand. (\$NZ2.90 inclusive of air-mail to Europe or \$NZ1.70 inclusive of surface mail).

David Duxbury and the editorial team of *Wings* magazine have combined to

produce a very useful 36-page monograph which provides a complete guide to all the military aircraft employed by the New Zealand armed forces during the 65 years since 1913. The emphasis of the work is exactly described in the title in that this is more a reference to the aircraft and the history of their procurement and service rather than an account of the operations in which they were involved.

The study is organised into three parts dealing with the historical evolution of New Zealand military aviation (mainly its organisation and equipment), secondly, a photo and summary service record of all the major aircraft types operated by New Zealand forces and, thirdly, a section detailing the less important and miscellaneous 'one-off' aircraft which have been taken on charge at various times. The second and third sections itemise the serial blocks of the aircraft as does a final page listing the RNZAF's current inventory.

This is a handy and compact presentation which deserves to become a standard source of information on the subject. **MH**

Jane's Pocket Book 14 — Home Built Aircraft by Michael J H Taylor, published by Macdonald and Jane's (£2.75: PVC limp)

Home Built Aircraft is a new addition to the range of handy size reference books in the 'Jane's' series. Author Michael J H Taylor has compiled a fascinating volume which presents the salient details for some 200 different types of 'homebuilt' aircraft — these being defined as 'not assembled on a production line or sold in completed form but built, with the aid of plans from parts or raw materials'.

If you thought you had a reasonable knowledge of the aviation scene, stand by to be surprised when you leaf through this book. The entries encompass a widely varying selection of types ranging from scaled-down replicas of WW2 fighters to specialist aerobatic aircraft, amphibians, ultra lightweights and 'seat of the pants' types which seem to be little more than framework flying surfaces strapped to the pilots. The contents are laid out so that an information summary appears opposite a photograph of the aircraft, each entry thus conveniently appearing as a double-page spread.

This compilation is a worthwhile follow-on from the separate section on homebuilts in *Jane's All the World's Aircraft* and it has an appeal and identity which reflect the uniqueness of some of the aircraft reviewed. In these days of high technology it is delightful to read in relation to one of the entries, for example:

"...several amateur-built examples have been completed and flown successfully since mid-1962. At least one of them...has obtained a full Certificate of Airworthiness". **MH**



Left: Harrier GR3, XZ133, of 233 OCU at RAF Wittering. This version of the aircraft is equipped with the laser rangefinder and marked target seeker in the 'dolphin'-shaped nose extension. Peter R March

Below: Jaguar GR1, XZ356 of No 41 Squadron at RAF Coltishall; the unit is primarily tasked in the reconnaissance role — note recon pod on centre line. Dennis J Calvert, Inter-Air Press

air view

Peter R March

The Royal Air Force Reviewed

ON 29 JULY Her Majesty The Queen will be reviewing the Royal Air Force at Finningley, Yorks. Representative aircraft from many units of both front-line and training/support squadrons will be lined up in an extensive static display and a short flying programme will also be presented. The airfield will be opened to the public on the following day when a full flying display will include overseas participation. It is appropriate therefore, in this 25th year of Her Majesty's reign to make our own review of the Royal Air Force.

The RAF was formed on 1 April 1918 by the amalgamation of the Royal Flying Corps and the Royal Naval Air Service. By the Armistice the service had destroyed more than 8,000 enemy aircraft and airships and dropped 8,000 tons of bombs. It had over 22,000 aircraft on strength in 1918. In 1919 the peace-time organisation was drawn up by the 'father of the Royal Air Force' Viscount Trenchard. The RAF College, to train cadets for permanent commissions, was opened at Cranwell in 1920.

Between the wars research and records were the keynotes of the RAF. The winning of the Schneider Trophy outright in 1931 was notable, not least in establishing the Supermarine development programme leading to the Spitfire. From 1934 onwards re-armament and expansion brought the RAF to readiness for the approaching conflict of World War 2. Unfortunately the rate of growth could not keep up with that of Germany and 1940 saw a Fighter Command force of just over 1,000 aircraft facing 3,500 German fighters and bombers. The war spread across the sea to the Middle East and by the end of 1941 to the Far East. The RAF operated in all theatres, but necessarily concentrated on the primary role in Europe — strategic bombing. Bomber Command made 392,137 sorties to drop just over a million tons of bombs. The final months of the war in Europe saw the tactical air forces coming into their own with the RAF capitalising on its hard won air superiority.

Pioneering and record breaking was



again a morale-booster in 1945 and 1946. Lancaster Aries I made the first British Flight over the North Pole and on 7 November 1945 a Meteor set a new world air speed record of 606mph. The first Atlantic crossing by jet aircraft was made by Vampires of 54 Squadron in 1948. In that same year the operations against the Communist terrorists in Malaya commenced and in June the Berlin Air Lift started its year-long ordeal. The Korean War in 1950 saw Transport Command flying troops out to Japan and Vampires re-equipped the Far East fighter squadrons. This distant war speeded up Britain's re-armament programme and for a short time the 20 fighter squadrons of the Royal Auxiliary Air Force were embodied in the RAF. In 1952, the year of Her Majesty's accession to the throne, the RAF was flying a post-war peak figure of 6,338 aircraft.

In terms of aircraft and manpower the RAF in 1952 was massive compared with 25 years later. Fighter Command had no less than 45 active squadrons (this included the RAuxAF units), most of which were equipped with Meteor FBs (25) and Vampire FB5s (13). Bomber Command had 26 squadrons including eight equipped with Lincoln B2s, eight with Washington B1s (B-29s) and four with Canberras. Transport Command had seven squadrons of which five flew the Hastings. Coastal Command operated 12 squadrons of which half used the Shackleton MR1. One of the biggest contrasts comes from Flying Training Command which, in 1952, had seven flying training schools, eight advanced flying schools, five air navigation schools and eight other schools including the CFS. Not unexpectedly it required 19

maintenance units to service the 6,000 plus aircraft.

The year 1952 also marked the turning point in the RAF's transition from piston to jet-powered front-line aircraft. The Canberra was fast entering squadron service and was followed by the Valiant, Vulcan and Victor bombers which built up the nuclear deterrent force from 1955. In 1954 Hunters and Swifts started to take over from Meteors and were followed by Javelins in 1956. The 1957 Defence White Paper which was interpreted as meaning that missiles would replace manned aircraft started the reduction of the RAF operational and reserve strength. The Mach 2 Lightning joined Fighter Command in mid-1960.

On 1 April 1964 the Air Ministry was replaced by the Ministry of Defence Air Force Department and the Air Council became the Air Force Board. In the same year the P1127 Kestrel tripartite evaluation squadron was formed. Another significant Defence White Paper followed in 1965, bringing about the scrapping of the P1154 and HS681 aircraft and the ordering of 66 Hercules and a large number of Spey-engined Phantoms from the USA. It was also decided to start phasing out RN aircraft carriers thus increasing the RAF's maritime responsibilities. Transport Command was increased in capacity with the delivery of VC10s, Belfasts and the 66 Hercules in the latter part of the 1960s. In August 1967 Air Support Command was formed with responsibility for strategic and tactical transport and close air support.

The last ten years have seen a radical re-shaping of the RAF in its structure, organisation, equipment and personnel. A

single operational command at home, Strike Command (STC) and a combined training and support command, RAF Support Command, control the reduced numbers of RAF Groups. Virtually all of the front-line aircraft are NATO-assigned for Alliance command and control in time of war. All of the overseas commands outside Europe have been disbanded with Strike Command controlling the RAF squadron remaining in Hong Kong and the two squadrons in Malta. The latter base will be vacated in 1978. Only RAF Germany (RAFG) with its 13 squadrons remains at anything like its former strength.

Changes in policy have meant changes in equipment. The strategic transport force of Britannias, Belfasts and VC10s has been severely cut back, leaving only the VC10s for passenger flying and Hercules for freight transport. Lightnings have been replaced in the fighter role by Phantoms both in the UK and Germany, just two Lightning squadrons remaining, at Binbrook, until they are re-equipped with the Tornado air defence variant (ADV) — probably in 1984-85. Likewise the Vulcans and Buccaneers will remain in service until the strike/attack and reconnaissance version of the Tornado (the IDS, or interdicator/strike, variant) enters service in the 'early-1980s'. Nimrods replaced the Shackletons for maritime duties in the early-1970s and these aircraft will be progressively up-dated in their equipment over the next five years. The airborne early warning Shackletons will remain in service until the AEW Nimrod is available. Jaguars have now replaced the Phantoms for a range of ground attack and reconnaissance duties in the UK and Germany and the V/STOL force of Harriers will be augmented by a further 20 aircraft, although the number of operational squadrons has been reduced from four to three. The tanker force has been equipped with Victor K2s but one squadron (214 Sqn) has been disbanded. There has been little change in the helicopter squadrons. Wessex have replaced two flights of Whirlwind HAR10s with 22 Squadron and Sea Kings in the SAR role will be delivered to four more flights in 1978/9.

On the training side the RAF has

Units of the Royal Air Force 1977

Operational Squadrons

Sqn Aircraft	Base	Command	Role
1 Harrier GR1A/T2/GR3	Wittering	38 Group/STC	Offensive support
2 Jaguar GR1	Laarbruch	RAFG	Reconnaissance
3 Harrier GR1A/T2/GR3	Gutersloh	RAFG	Offensive support
4 Harrier GR1A/T2/GR3	Gutersloh	RAFG	Offensive support
5 Lightning F3/F6	Binbrook	11 Group/STC	Air defence
6 Jaguar GR1	Coltishall	38 Group/STC	Offensive support
7 Canberra B2/T18	St Mawgan	18 Group/STC	Target facilities
8 Shackleton AEW2	Lossiemouth	11 Group/STC	AEW
9 Vulcan B2	Waddington	1 Group/STC	Strike/attack
10 VC10	Brize Norton	38 Group/STC	Long-range transport
11 Lightning F3/F6	Binbrook	11 Group/STC	Air defence
12 Buccaneer S2A/S2B	Honington	1 Group/STC	Strike/attack
13 Canberra PR7	Luqa, Malta	AHQ Cyprus/STC	Reconnaissance
14 Jaguar GR1	Bruggen	RAFG	Strike/attack
15 Buccaneer S2A/S2B	Laarbruch	RAFG	Strike/attack
16 Buccaneer S2A/S2B	Laarbruch	RAFG	Strike/attack
17 Jaguar GR1	Bruggen	RAFG	Strike/attack
18 Wessex HC2	Gutersloh	RAFG	Troop transport
19 Phantom FGR2	Wildenrath	RAFG	Air defence
20 Jaguar GR1	Bruggen	RAFG	Strike/attack
22 Wessex HAR2	Manston, Valley		
Whirlwind HAR10	Leuchars	18 Group/STC	Search and rescue
23 Phantom FGR2	Chivenor, Brawdy		
24 Hercules C1	Wattisham	11 Group/STC	Air defence
25 Bloodhound 2	Lyneham	38 Group/STC	Tactical transport
27 Vulcan SR2	Deployed RAFG	RAFG	SAM defence
28 Wessex HC2	Scampton	1 Group/STC	Maritime recce
29 Phantom FGR2	Kai Tak (to Sek Kong)	Hong Kong/STC	Troop transport
30 Hercules C1	Coningsby	11 Group/STC	Air defence
31 Jaguar GR1	Lyneham	38 Group/STC	Tactical transport
32 HS125, Whirlwind HC10, Andover C2, HS748 CC2	Bruggen	RAFG	Strike/attack
33 Puma HC1	Northolt	38 Group/STC	Communications
35 Vulcan B2	Odiham	38 Group/STC	Troop transport
39 Canberra PR7/PR9	Scampton	1 Group/STC	Strike/attack
41 Jaguar GR1	Wytton	1 Group/STC	Reconnaissance
42 Nimrod MR1	Coltishall	38 Group/STC	Reconnaissance
43 Phantom FG1	St Mawgan	18 Group/STC	Maritime patrol
44 Vulcan B2	Leuchars	11 Group/STC	Air defence
47 Hercules C1	Waddington	1 Group/STC	Strike/attack
50 Vulcan B2	Lyneham	38 Group/STC	Tactical transport
51 Nimrod R1/Canberra B6	Waddington	1 Group/STC	Strike/attack
54 Jaguar GR1	Wytton	1 Group/STC	ECM/recce
55 Victor K2	Coltishall	38 Group/STC	Offensive support
56 Phantom FGR2	Marham	1 Group/STC	Air refuelling
57 Victor K2	Wattisham	11 Group/STC	Air defence
60 Pembroke C1	Marham	1 Group/STC	Air refuelling
63 Hunter F6/F6A	Wildenrath	RAFG	Communications
70 Hercules C1	Brawdy	11 Group/STC	Tactical Weapons Unit
72 Wessex HC2	Lyneham	38 Group/STC	Tactical transport
79 Hunter F6A/FGA9	Odham	38 Group/STC	Troop transport
84 Whirlwind HAR10	Brawdy	11 Group/STC	Tactical Weapons Unit
85 Bloodhound 2	Akrotiri	AHQ Cyprus/STC	UNFICYP support
92 Phantom FGR2	West Raynham	11 Group/STC	SAM defence
100 Canberra B2/T19	Wildenrath	RAFG	Air defence
101 Vulcan B2	Marham	11 Group/STC	Target facilities
111 Phantom FGR2	Waddington	1 Group/STC	Strike/attack
115 Argosy E1/Andover E3	Leuchars	11 Group/STC	Air defence
120 Nimrod MR1	Brize Norton	38 Group/STC	Radar calibration
201 Nimrod MR1	Kinloss	18 Group/STC	Maritime patrol
202 Whirlwind HAR10	Kinloss	18 Group/STC	Maritime patrol
	Boulmer, Leconfield		Search & rescue
	Coltishall, Lossiemouth		
203 Nimrod MR1	Luqa, Malta (to 1978)	AHQ Cyprus/STC	Maritime patrol
206 Nimrod MR1	Kinloss	18 Group/STC	Maritime patrol
207 Devon C2	Northolt	38 Group/STC	Communications
208 Buccaneer S2A/S2B	Honington	1 Group/STC	Strike/attack
230 Puma HC1	Odiham	38 Group/STC	Troop transport
234 Hunter F6/6A/FGA9/T7	Brawdy	11 Group/STC	Tactical Weapons Unit
360 Canberra T17	Wytton	38 Group/STC	ECM training
617 Vulcan B2	Scampton	1 Group/STC	Strike/attack

Operational Conversion Units:

226	Jaguar GR1/T2	Lossiemouth
228	Phantom FGR2	Coningsby
230	Vulcan B2/Hastings T5	Scampton
231	Canberra B2/T4	Marham
232	Victor K2	Marham
233	Harrier GR1A/T2/GR3	Wittering
236	Nimrod MR1	St Mawgan
237	Buccaneer S2	Honington
240	Puma/Wessex	Odiham
242	Hercules C1	Lyneham

Flying Training Schools etc

Central Flying School	Bulldog T1	Leeming
Central Flying School	Jet Provost T3A/T5A	Cranwell
Central Flying School	Gnat T1/Hawk T1	Valley
Central Flying School	Gazelle HT3/Whirlwind HAR10	Shawbury/Valley
RAF College	Jet Provost T3A/T5A/Dominie T1	Cranwell
1 FTS	Jet Provost T3A/T5A	Linton-on-Ouse
2 FTS	Bulldog T1	Leeming (Initial & RN Training)
4 FTS	Gnat T1/Hunter F6/T7	Valley (to have Hawk T1)
6 FTS	Jet Provost T4/Dominie T1	Finningley
School of Refresher Flying	Jet Provost T3A/T5A	Leeming
Multi-engine Training Squadron	Jetstream T1	Leeming
Central Air Traffic Control School	Jet Provost T4	Shawbury
University Air Squadrons (16)	Bulldog T1	
Air Experience Flights (13)	Chipmunk T10	
Gliding Centres & Gliding Schools	(some to have motor gliders in 1977)	

Miscellaneous units:

Queens Flight	Andover CC2/Wessex HCC4	Benson
Tactical Weapons Unit	Hunter/Jet Provost	Brawdy
Red Arrows	Gnat T1	Kemble
Battle of Britain Flight	Spitfire/Hurricane/Lancaster	Coningsby
Vintage Pair	Meteor T7/Vampire T11	Cranwell

Royal Aircraft Establishments: Farnborough, Llanbedr, Bedford, West Freugh

Aircraft & Armament Experimental Establishment: Boscombe Down

Empire Test Pilots School: Boscombe Down

Maintenance Units: 5 MU Kemble, 19/32 MU St Athan, 60/71 MU Abingdon, 431 MU Bruggen

brought out of store a number of Jetstreams to resume multi-engine pilot training. Hawks are being delivered to replace the ageing Gnats with CFS and 4FTS. They will in turn also replace the Hunters with the Tactical Weapons Unit. Re-worked versions of the Jet Provost T3 and T5 will continue to be the basis for pilot training for many years to come. Bulldogs have replaced Chipmunks with all but the air experience flights. It has been announced recently that many of the RAF's Canberras still in use for reconnaissance and a variety of second-line duties will be given major overhauls by the manufacturers to enable them to remain in service for a further ten years.

The RAF has been transformed from being an air force with a world-wide capability to being an arm of NATO, albeit a powerful one, dependent on allies for its continued ability to keep its potential enemies at arms length. While the Warsaw Pact and Soviet forces steadily increase their offensive potential both in the nuclear and conventional roles, successive cut backs in UK defence expenditure have continued to chip away at the air arm

Opposite page: Gazelle HT3, XW862, which operates in the rotary wing training role with CFS. Peter R March

Right: Immaculate Harvard IV F-BRGB which was a deserved prize-winner at the 23rd Jersey International Rally. A S Wright

Below right: Prentice G-APJB, a visitor to the PFA fly-in at Stapleford on 1 May and at Staverton on 8 May, where this photo was taken. Peter R March



trek to the Channel Islands. There were representatives from Britain, Germany, Belgium, Denmark, France, Sweden, Ireland, America, Holland and Morocco. Although predictably a large number were the usual Piper and Cessna variants, nevertheless, there were notable exceptions. Ex-Luftwaffe Harvard IV F-BRGB was a star attraction, winning the prize for the over 10 year old machines. Other winners included Tiger T5424, now wearing Royal Navy markings in preference to its civilian marks of G-AJOA and Turbulent G-APVZ (both from Weston-super-Mare), Baron G-BAAG, Fuji G-BDFS and Musketeer D-ENXO. Alpine G-APCX was the sole Auster present — it reported an encounter with a Canberra en route to Jersey. Some expected visitors failed to arrive, including Partenavia P68 D-GIGI, which thereby missed becoming a first time visitor. A couple of helicopters did make it, but looked somewhat out of place amongst the ranks of fixed wing aircraft. They were Hughes 269B, OO-PEV, prudently equipped with floats, and Alouette F-ZBAU.

The second major PFA strut fly-in of the year took place at Stapleford Tawney on 1 May. Early morning fog and low cloud prevented any attackers from getting to the airfield for the breakfast patrol, but a rapid mid-morning clearance enabled about sixty aircraft to take part in the fly-in. The longest journeys were made by Emerald G-AXXC from Sherburn (one of four of the type present, the others being G-ASLX, G-AZGY and G-BCCR) and Cessna 172 G-ASSS from Bristol. PFA aircraft present included Taylor Monoplane G-AXYK, Jodel D9s G-



AXKJ and G-AXYU, Evans VPI G-BDUL, Luton Minor G-ATKH, Currie Wot G-BANV and Rand KR-2 G-BEKR, albeit half completed on a trailer. Other visitors included Prentice G-APJB, Tiger Moth G-ANDE and Austers G-AHAU, G-AHHT, G-AIPR and G-AMZI.

The fly-in at Audley End near Saffron Walden in Essex on 15 May attracted only a couple of dozen aircraft, a much lower number than in 1976. This hill-top strip unfortunately suffered a strong cross wind which no doubt kept many potential visitors at home. Those that did arrive were fortunate in witnessing one of the most spectacular displays by an Auster seen for many a year. G-AJUL in all its thirty years or so surely has never performed so well. An American registered Chipmunk, N99140, resplendent in last year's bicentennial colours was a welcome visitor, as were the four Tigers G-AHIZ, G-AOEL, G-ANZU and G-ANOH although it really was not Tiger weather at Audley End. VP-1 G-BDUL battled in from Peterborough, while a formation of three Turbulents, G-AJCP, G-ARMZ and G-ASHT, Hornet Moth G-AESE and Scout (Citabria variety) N8693 came over from Gransden.

Many of the visitors indulged in some flying during the afternoon, at least they did once released from the heavily rutted parking area amongst the crops. A pleasantly informal affair in the heart of the Essex countryside. The single hangar revealed spatted Alpha G-AIGT, a couple of Jodels and the Luton Minor G-BBEA, the latter under repair after an argument with a barbed wire fence.

Throughout the summer flying clubs from the UK and Europe arrange tours and club exchanges, most of which pass un-recorded. The Martinair Flying Club from Holland visited Swansea and Rhosce on 7-8 May, for example. Five Fujis PH-CAR, PH-MBI, PH-MBK, PH-MBO and PH-MBM were the visitors on this occasion. Exchanges between the Hanover Flieger Club and the Bristol & Wessex Aero Club have been taking place for several years. Nine German Aircraft travelled to Lulsgate on 19 May, including Bonanza D-EECO, Debonair D-ENNR, and Cessnas D-EMSK, D-EAME, D-EGSI and D-EADM.

Cloudless summer weather encouraged nearly one hundred visiting aircraft to Old Warden on 22 May for a fly-in. The event was jointly sponsored by the Shuttleworth Collection and the Aircraft Owners and Pilots Association (AOPA) with support from the PFA, Auster Pilot Club and the Vintage Aircraft Club. The aim of the day was to bring together owners and pilots of light aircraft to discuss common problems, particularly those related to maintenance. Amongst the visitors the following were noteworthy: Arrow G-AJAM, Schleicher

ASK-16 G-BCTI, Auster 5 NJ703 (G-AKPI), Fury G-AYJY, Active G-ABVE, Jackaroo G-APAJ, Currie Wots G-AYNA and G-ARZW, Topsy B G-AISB and Hornet Moth G-AELO.

Preservation view

The British Aircraft Preservation Council held its 40th quarterly conference at Liverpool Airport recently. The following information comes from the report of this meeting.

At Coventry the newly formed Aircraft Radio Museum has acquired the fuselage of Jet Provost T4 XR654 formerly used by the Macaws team from the College of Air Warfare, Manby. The British Rotorcraft Museum is to hold open days at Weston-super-Mare, Avon on 24 July, 7, 14 and 21 August. Exhibits will include the Belvedere XG452 for which more parts are eagerly sought to complete its restoration.

As reported last month the Sea Fury T20 was flown at Yeovilton on 5 April. Unfortunately technical problems with this aircraft seem likely to keep it grounded for much of the summer. The Fleet Air Arm museum's new display hangar and other facilities will be opened to the public by July. At Duxford the Imperial War Museum aircraft collection is open to the public daily from 11.00 to 17.00 until the end of September. Whilst many of the Duxford exhibits are flown regularly, it has not been possible to have the airfield open to visitors wishing to fly in. However, recent negotiations with the Cambridgeshire County Council and the Defence Land Agents have secured the future of the wartime airfield and the right to allow visiting

aircraft. Duxford Airfield is therefore now open on a 'PPR' basis. Visiting pilots should obtain clearance by telephoning 0223-871100. The landing fee (£2.50) includes admission the museum site.

The Newark Air Museum has moved Shackleton MR3 WR977 bit by bit from Finningley to Winthorpe. It is hoped that a Hastings will shortly be acquired. The Westland Wallace K6038 has been passed to the RAF Museum. At St Athan the Historic Aircraft Museum has repainted the Meteor NF14 WS843 in 64 Squadron markings, coded Y. In Scotland the Strathallan Collection will have the recently restored Bolingbroke and the Scion VH-UUP on display during the summer months. A new addition is BA Swallow G-ADPS. The Ulster Folk and Transport Museum has Spitfire 16 Te184 fully restored except for a seat, control column and rudder bar. Anyone able to help in locating these items should contact the Director, telephone Holywood 5411.

The Northumberland Aeronautical

Opposite page: Phantom FGR2, XT912/K, of No 23 Squadron at RAF Wattisham. As indicated on page 296 the Phantom is now the mainstay of 11 Group/STC air defence squadrons.

Martin Horseman

Below: Resplendent in its new paint scheme, Meteor NF14, WS843/Y, at RAF St Athan in the markings of No 64 Squadron. *Austin J Brown*

Bottom: Also repainted recently was this ex-FAF F-100D (54-2269) destined for 'gate duty' at Lakenheath in 48th TFW markings. *Roger Wright*





Collection, previously the North East Vintage and Veteran Aircraft Association, has added Hunter F51 E-419/G-9-441 (ex R. Danish Air Force) to its collection at Sunderland-Usworth. The Aeroplane Collection (NAPS) is negotiating for Anson C19 VV901. A Vampire T11, from Linton-on-Ouse, has been obtained by the South Yorkshire APS. Latest additions to the BAPC register are BAPC 101 — HM14 Pou du Ciel — Lincolnshire Aviation Museum; BAPC 104 — Bleriot XI Replica — RAF St Athan (ex-G-AVXV?); BAPC 105 — Bleriot XI Replica — Mosquito Aircraft Museum (built at Colerne).

Around and about

At Lakenheath, Suffolk the first F-111F to be painted up in the markings of the 48th TFW was 70-2373. It carries the tail code LN and the wing badge. This aircraft was first flown from the base on 30 April for a 90 minute test flight. The first deployment of 15 F-111Fs was due to arrive on 1 June. Also at Lakenheath the ex-French Air Force F-100D Super Sabre 54-2269 has been painted to represent an F-100D of the 48th TFW. It carries the spurious serial 54-048, for obvious reasons.

Five EB-57Es from the 17th Defence Systems Evaluation Squadron, Aerospace Defense Command USAF visited Bentwaters during April and May to take part in a variety of NATO exercises. Serialled 55-4278, 55-4280, 55-4287, 55-4290 and 55-4292 the EB-57s, the last of the type in front-line service, are usually based at Malmstrom AFB, Montana. Another US based unit visiting the UK was the 363rd TRW, making a two-day stop at Alconbury on 26-27 April. Eighteen RF-4C Phantoms had been deployed to Erding AB in West Germany and the stop-over was made on the return journey to Shaw AFB, South Carolina. Once again these trans-Atlantic flights generated a good deal of KC-135 activity at Mildenhall. Even the previous generation of tankers put in an appearance here, when KC-97L 30298 of the Texas Air Guard arrived on 27 April.

Further north Newcastle has seen a not unexpected US presence for several weeks

with the visit of President Carter to the area. VC-137C 26000 appeared on 18 April and again on 6 May when it supported 'Air Force 1' 27000 and was accompanied by a pair of C-141s. More surprising was the appearance of B-52H 00025 on 29 April making a practice diversion en-route from the Spadeadam range to Marham, while taking part in the bombing contest. A few days earlier EA-6B Prowler 158547 of VAQ-136 from USS *Independence* to Leuchars also managed an approach at Newcastle.

Prestwick continues to see interesting aircraft, many of them in passage between Europe and the USA or vice versa. On 22 April a retired Italian S-2A Tracker MM136560 was on its way back to the USA marked as N91368. Five days later Nigerian Air Force C-130H Hercules 914 was a visitor. A new Cessna 404 F-GAJX was noted on a delivery flight on 3 May. A journey to retirement was being made by Whirlwind HAR9 XL875 on 2 May, stopping at Prestwick en route from Lee-on-Solent to Perth, where it will be used as an instructional airframe by Airwork.

Air events — JULY

The following list of air events for July is believed correct at the time of going to press. Readers are advised to seek confirmation that the events they plan to attend are taking place and that they are open to the public.

- July
- 1-3 PFA International Rally, Sywell, Northants
 - 2 Hawker-Siddeley Families Day, Hatfield, Herts
 - 2 Bembridge Air Show, Bembridge, IOW
 - 2 RAFA-SW Air Show, Exeter, Devon
 - 2-3 Aerobatic Competition, Sleep, Salop
 - 3 Aerospace Museum Open Day, RAF Cosford, Salop
 - 9 Plymouth Air Show, Plymouth, Devon
 - 9 Open Day, RAF Halton, Beds
 - 10 Air Day, Thruxton, Hants
 - 10 Hull Air Show, Hull-Paull, Humberside

Above left: Boeing VC-137C, 26000, at Newcastle. I MacFarlane

Above: The Nigerian Air Force C-130H Hercules which visited Prestwick on 27 April. Gordon Brown

- 10 Air Display, Knebworth Hall, Herts
- 14 Open Day, RAF St Mawgan, Cornwall
- 16 Open Day, RAF Stafford, Staffs
- 16 Air Display, British Grand Prix, Silverstone, Northants
- 16 Open Day, RNAY, Wroughton, Wilts
- 17 Manchester Air Show, Barton, Lancs
- 17 Air Display and Races, Shobdon, Hereford & Worcs
- 17 Air Show, Weston Park, Salop
- 20 Open Day, HMS *Gannet*, Prestwick, Strathclyde
- 23 Air Day, RNAS Lee on Solent, Hants
- 23 Fly-in, Denham, Bucks
- 23-24 PFA Fly-in, Bagby-East Point, N. Yorks
- 23-24 Navy Days, Portland, Dorset
- 24 PFA Hampshire Strut Rally, Popham, Hants
- 27 Air Day, RNAS Culdrose, Cornwall
- 29-30 RAF Royal Review, Finningley, Yorks (Note — open to public 30th only)
- 30-31 Air Festival, Blackbushe, Hants
- 31 Cornwall Flying Club Air Day, Bodmin, Cornwall
- 31 Shuttleworth Flying Day (Military Air Day), Old Warden, Beds

For some of this month's contributions we are indebted to Messrs M. Barnett, P. J. Bish, A. J. Brown, G. Brown, A. Crouch, P. Cuniffe, J. Guthrie, B. Hickman, I. MacFarlane, D. O'Mahony, A. P. March, B. R. Robinson, P. A. Rowlings, E. A. Shackleton, D. Spurgeon, R. J. Starling, D. G. White, A. J. & A. S. Wright and R. Wright. Also the publications *Air North*, *Air Scotland*, *Air Strip*, *Aviation Ireland*, *British Aviation Review*, *Flypast*, *Prestwick Air Letter*, *Scottish Air News*, *Skyward* and *South West Aviation News*.

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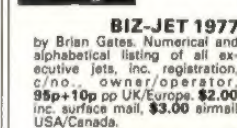
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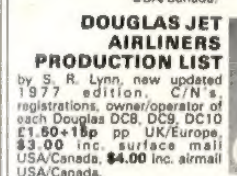


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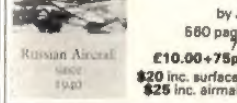
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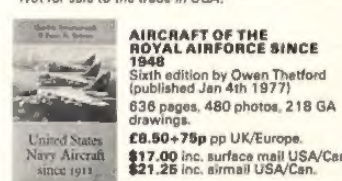
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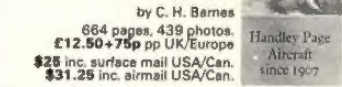
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